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THE Chemical Age

VOL. LXXII 23 APRIL 1955 No. 1867

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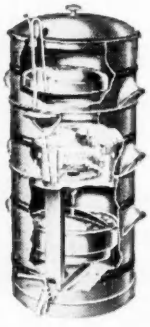

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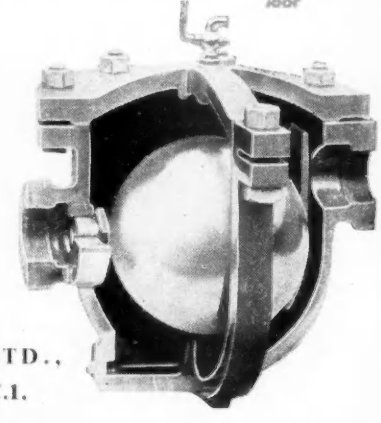

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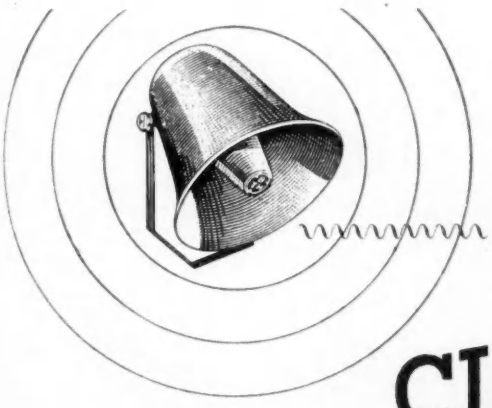

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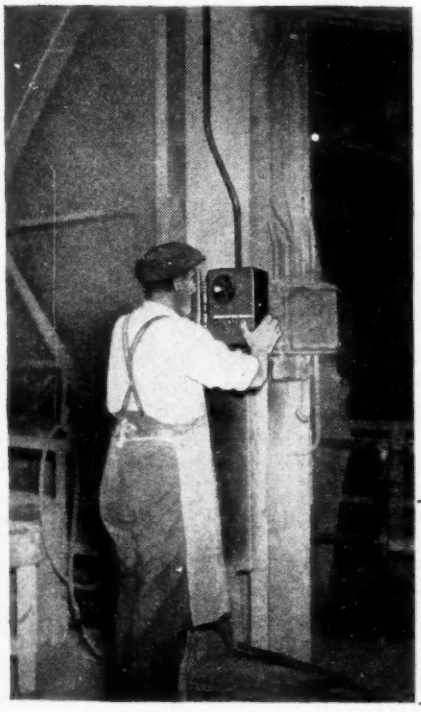

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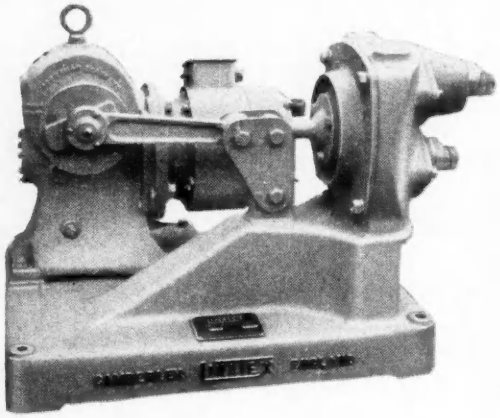

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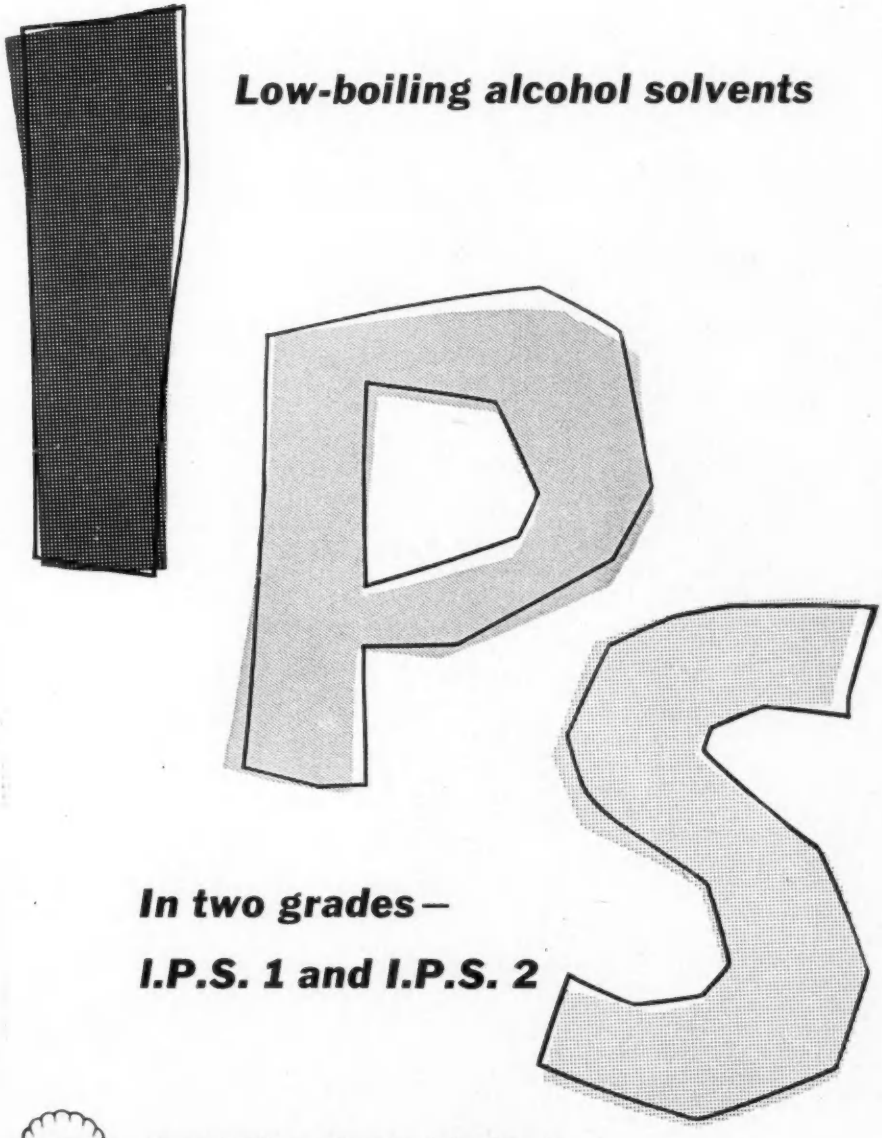

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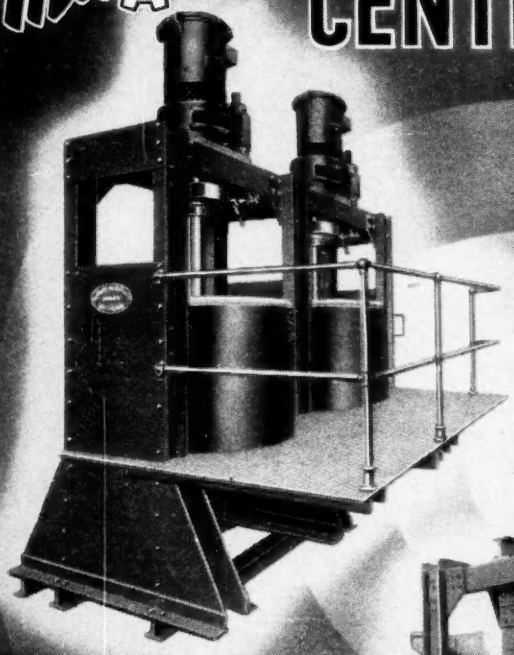

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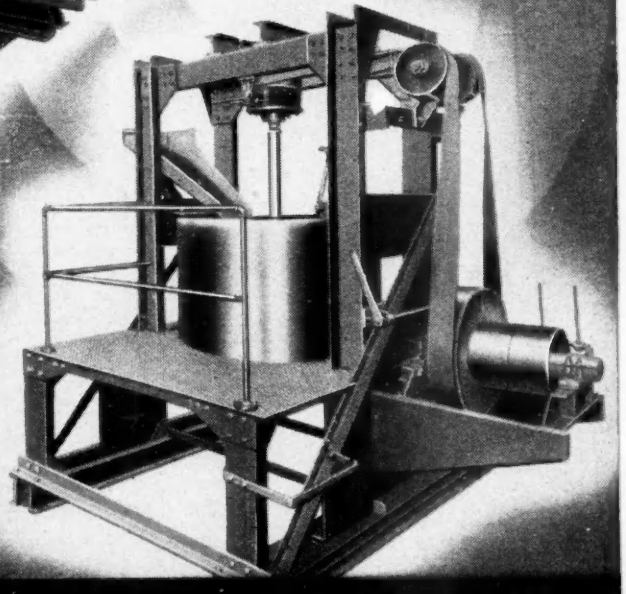

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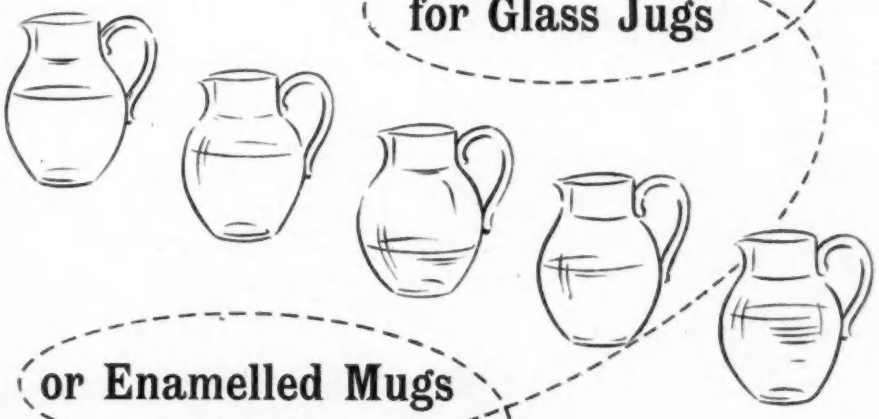

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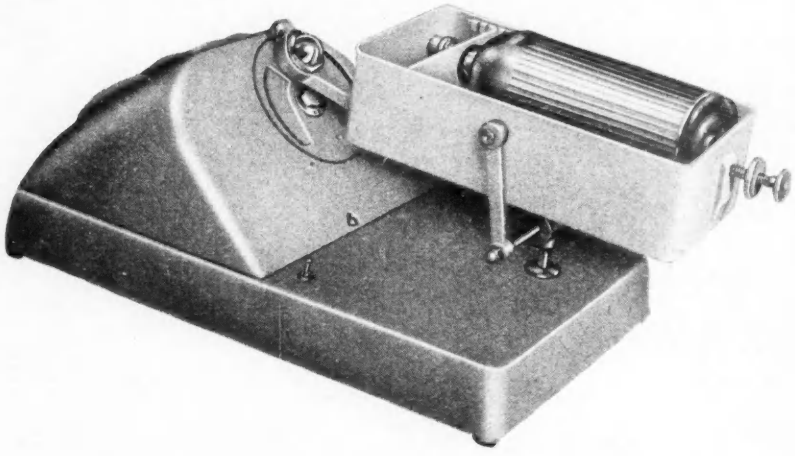

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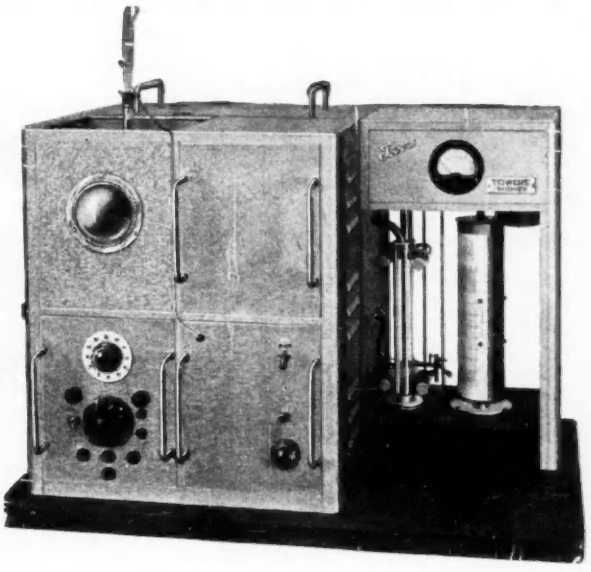

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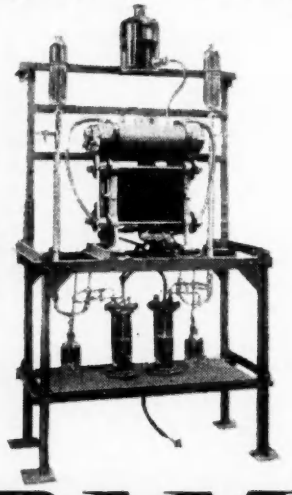

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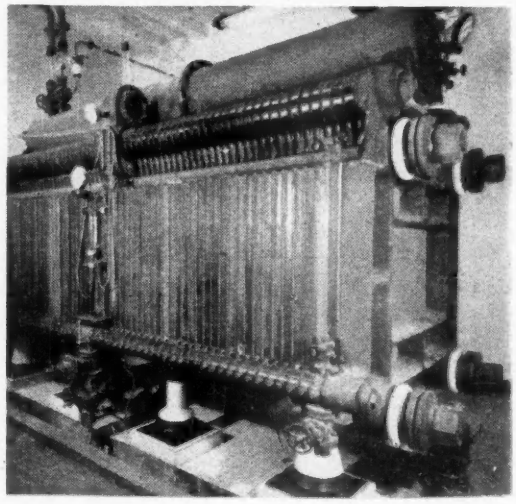

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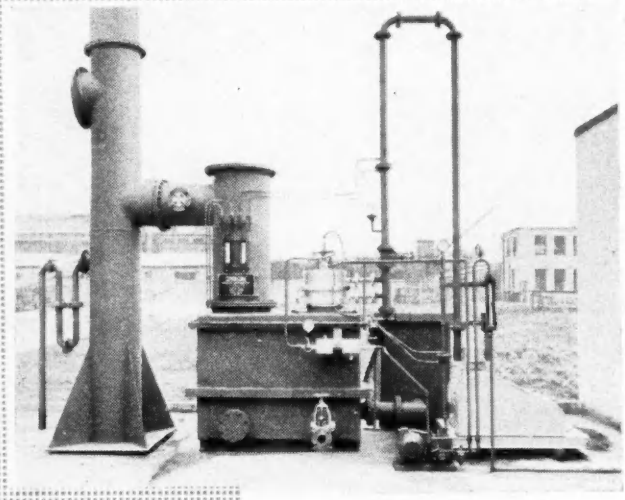

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Volume LXXII
Number 1867

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Established 1919

The Weekly Journal of Chemical Engineering and Industrial Chemistry

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CONTENTS . 23 APRIL 1955

Physical Society's Exhibition	935
Evasion of Customs Duty	938
The Drying of Iron Pyrites	939
Electro-Precipitation of Flue Dust	943
In the Editor's Post	944
Salaries for Chemists	945
Stearic Acid Substitutes	946
The Chemist's Bookshelf	947
Home News Items	949
Overseas News Items	950
Personal	951
Publications & Announcements	953
Glass Bubble Caps	955
Next Week's Events	956
Law & Company News	958
Market Reports	960

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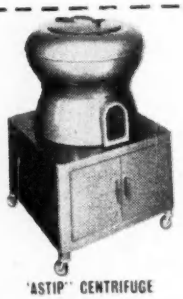

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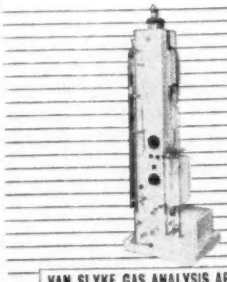

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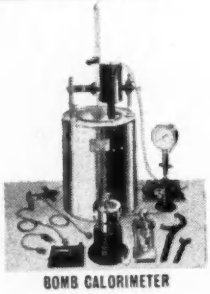

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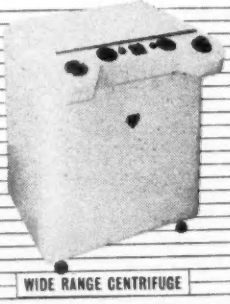

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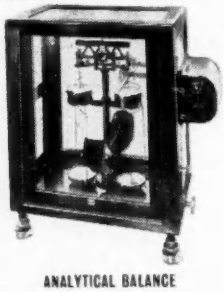

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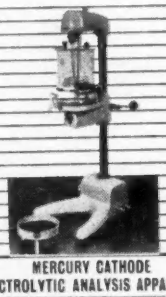
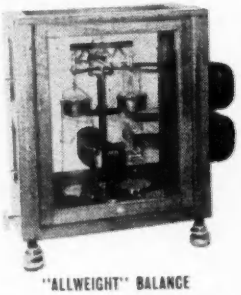
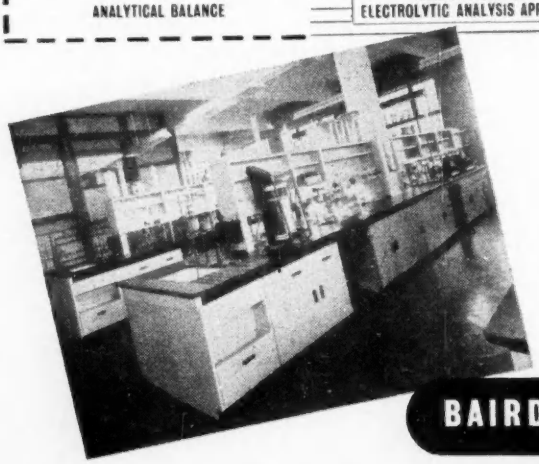


MERCURY CATHODE ELECTROLYTIC ANALYSIS APPARATUS



"ALLWEIGHT" BALANCE



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Nitrogen in the Dock?

SYNTHETIC fixation of nitrogen—now some 40 years old—has brought about an agricultural and nutritional revolution. Professor Hugh Nicol, one-time of Rothamsted and now at the West of Scotland Agricultural College, regards this as 'misplaced enthusiasm.' In his newly published book, 'Microbes and Us' [1955, Penguin Books (Pelican series), 2s. 6d.], Nicol presents a powerful case against synthetic nitrogen.

Crookes's 1898 warning that unless the fixation of nitrogen could be achieved, the white races must 'cease to be foremost in the world, and will be squeezed out of existence by the races to whom wheaten bread is not the staff of life' has been so frequently quoted that it has acquired hallowed authenticity. In truth, however, history since 1898 has merely appeared to substantiate Crookes's argument. Synthetic fixation had become a widespread, large-scale industrial process within 20 to 25 years. In the same time-period the world's production of wheat grain also expanded enormously. There are few agricultural scientists who now do not realise that other factors far more decisive than this advent of air-won nitrogen led to the twentieth century rise in wheat output. As Nicol rightly insists, much of the extra production came from the opening-up of semi-arid land, e.g., North America and Australia, where little nitrogen has in fact been used and where in any case little could be used without irrigation. New varieties of wheat, the work of plant breeders, also made a major contribution.

Nevertheless, on more humid soils, on much of the soil that was being cropped in Crookes's era and still is cropped now, wheat yields have been substantially raised and in this advancement the contribution of nitrogenous fertilisers has been definite enough. The use of 1 cwt. of sulphate of ammonia will lead to an increase per acre of about 2 cwt. of grain; the use of a second hundredweight of that fertiliser will bring about a further increase of at least 1 cwt. of grain. Admittedly this is an over-simplified account for the extra growth also takes more phosphate and potash from the soil, and an extra drain upon its lime reserve is created. These 'deficits' must be balanced; nevertheless, it is nitrogen that is the spear-head of extra productivity. The pre-war average yield of wheat grain in Britain was between 17 and 18 cwt. per acre; in 1952/53 the average yield was just under 23 cwt. On farms where a high rate was used, most yields were much above the average.

A new publication from the United States Department of Agriculture (Handbook No. 68) attempts a nationwide survey of existing fertiliser use and, by using all available experimental evidence, a further survey of potential responses to maximum fertiliser applications. Leaving out the semi-arid and highly variable soils of the Western States, it is calculated—and by conservative inter-

pretation of experimental or pilot-scale results—that the present annual output of wheat grain (1950 figures) of 734,253,000 bushels could be raised by the fullest profitable use of fertilisers to 1,431,737,000 bushels. However, this potential doubling of wheat output from the same acreage as that now cropped is again based upon the nitrogen spearhead, even though it must rest also upon the supply of other nutrients. Any reality for these facts or potentialities rests upon the synthetic fixation. Well above 80 per cent of the world's present use of nitrogen is already derived from synthetic fixation.

It is Nicol's case that the provision of nitrogen by this means is uneconomic! He discusses the consequences of fixing a further 1,000,000 tons of nitrogen from the air. That 1,000,000 tons of nitrogen would be in a final form of 5,500,000 tons of nitrogenous fertiliser. To balance the other major demands of nitrogen-increased plant-growth, 2,500,000 tons of potash fertiliser, 4,500,000 tons of phosphatic fertiliser, and about 6,000,000 tons of limestone would also be required. Also 4,000,000 tons of coal would be absorbed in the process of nitrogen fixation, and if superphosphate, as is likely, was the main type of phosphatic fertiliser used, a new demand for 400,000 tons of sulphur would have to be faced. It may be said that if this budget of material consumption is indeed uneconomic, then this also applies to the synthetic nitrogen already being produced—yet in fact farmers buy synthetic nitrogen heavily and find that it pays. The answer is that continual expansion of nitrogen synthesis must cause an intensifying demand upon wasting mineral assets, so that at some stage of expansion the costs of these other requirements will rise sharply.

This criticism of what is generally regarded as one of the greatest scientific advances of the century would be merely destructive if there was no alternative means for providing plants with nitrogen. But fixation of nitrogen from the air can be achieved by the *azotobacter* and other soil inhabitants, and most especially by the nodule-parasitic bacteria associated with leguminous plants. Clover in the sward or nitrogen in the bag is a profound farming dilemma; the work of these nitrogen-fixing bacteria must be supported by lime, by phosphates, and by potash, but the total budget of mineral requirement is substantially smaller than the budget presented by synthetically fixed nitrogen. In addition, Nicol makes the point that most plants convert fertiliser nitrogen into carbohydrates or oils with only small accompanying production of protein, but the leguminous plants convert an unusually high proportion of assimilated nitrogen into vegetable protein. The legume crop gives a better balance of starch/protein food, yet it also leaves behind in the soil a surplus residue of fixed nitrogen to support the growth of following crops. Nicol is certainly not alone in believing that clover pastures and leys are the bedrock of efficient food production; his case is chemical and economic, however, whereas most agricultural pleas for clover have been tinged with a romantic nostalgia.

Hugh Nicol's book should be thoughtfully read by all chemists. He has flung a giant-sized question-mark into modern scientific thought. If his criticism of synthetic nitrogen's contribution to our food supply is not correct, what is the answer that disproves it? Our own tentative view is that synthetic fixation and the use of the fertilisers it produces can expand substantially yet before stumbling against the economic barriers that Nicol has predicted. In short, that any economic weakness is futuristic. So, too, may be the answer and solution. It is a strange thing that in the book there is only one mention of uranium and that in connection with the new demand its 'atomic' processing has made upon sulphur. Is the relief of pressure upon coal that atomic energy may bring to be so easily dismissed? Is it not something of a repetition of Crookes's 1898 error to foresee a technico-economic collapse in 50, 100, or 200 years' time against a background of present sources of energy and present methods of food production? Professor Nicol may reply justly enough that his case is not answered by conjectural excursions; but it is as fair to say that in climatically suitable areas of the world synthetic nitrogen has not demonstrably failed yet.

Notes & Comments

Getting it Done

LATEST annual report (for 1954) from the Stanford Research Institute, which is located in California, contains at least one staggering sentence—'SRI began 1954 with a staff of 674; the year ended with 916.' It is a fairly young research centre, only now in its ninth year, and rapidity of growth is the prerogative of youth. But a staff increase of 242, of whom two-thirds had had professional training and all are men with 5 or 10 years of industrial experience; how in these days of technical man-power scarcity has such a feat been achieved? First-class research facilities? Pay? Opportunity? The main reason may be a complex of all these possible influences.

The Stanford Set-up

STANFORD is, of course, an independent, non-profit-making research organisation founded by business-men of the Western States, and specifically devoted to applied research. Most research projects there are sponsored. A firm can contract with SRI; when this is done, the firm must meet the costs of the research project plus indirect costs for the Institute's overhead expenses, etc. In return, the research results are the property of the client; disclosure without permission is not allowed, and any patent rights that may emerge belong to the firm. In addition, the Institute carries out research projects of its own, mainly to develop the 'skills and programmes' of the centre, and research of public interest is also undertaken. In 1953, 382 projects were in hand; in 1954 the number rose to 478. About 60 per cent of research is contracted by industry, 30 per cent is government research, and 10 per cent is 'self-determined' by SRI. By no means all the research is scientific in a chemical, physical, or biological sense; modern economic surveying projects are also undertaken. There can hardly be any similar centres where the range of investigation forms such a long panorama.

Mental Cross-pollination

MENTAL cross-pollination that takes place inside SRI must be exceptionally potent. Does this provide a better pattern for applied research than the norm of specialisation? At present it seems that it does. In any case, the provision of funds for research seems to be one of the minor problems of SRI. The new annual report is as much a public relations effort as it is a report upon research itself. That is perhaps the inevitable consequence of the confidential conditions under which so much of the research is done. None the less, it is a thought-provoking document. Would a similar research centre in Britain be any less successful?

Acetoglycerides

MIXED glycerides of acetic acid and various fatty acids are by no means new, but for more than 40 years their existence seems to have been confined to academic records. They are quite simple to make, acetic anhydride reacting with fatty acids or esters at a little above 100°C. A range of mixed glycerides can be produced—the fatty acid is one variable factor, the extent of acetylation is another. It is, of course, much the usual story of molecule-building in modern organic chemistry, though considerably less complex than building up polymers for plastics. Acetoglycerides are fats, but their physical properties offer unusual variations—they may be transparent liquids or non-greasy solids that are highly flexible. Ringing the changes on fatty acids or acetylation can produce physical properties 'to order' within the range of acetoglyceride possibilities. Commercial production being simple enough and the raw materials required not being costly, acetoglycerides are by no means expensive. About 70 cents per pound is currently being quoted in US, where one company has already distributed thousands of samples with a view to developing a large market (*Chemical & Engineering News*, 1955, **33**, 1298).

Possible Uses

ONE predictable use for the solid acetoglycerides is as a 'skin-tight' pack for meats. The extraordinary flexibility of these substances makes this possible. Cuts of meat, steaks, etc., can be dipped in the hot and molten acetoglyceride (at just above 100°C)—on cooling the liquid film deposited congeals but its natural flexibility prevents fracturing. The meat is virtually sealed within a transparent surface-tight pack. Moisture loss is prevented during cold storage, rancidity development checked, mould growth made impossible so long as the coating remains undamaged. Their edibility—or at any rate their 'non-inedibility'—seems safely assured by their origin and method of manufacture. When fully purified, they are almost tasteless and odourless. However, final evidence of safe edibility has not yet been submitted to the US Food and Drugs Administration. Other uses seem likely in the solvent field; liquid acetoglycerides may ease difficult solvent problems for pharmaceutical and cosmetic chemicals. They are said to be poor solvents for hardened fats, and as a result mixtures will maintain an unchanging solids/liquid ratio through a wide temperature range; mixtures of this type may be useful in the food industry as 'spread' plasticisers. Liquid acetoglycerides may also have direct possibilities as plasticisers in the plastics industry.

Inorganic & Nuclear

A NEW journal of which the first issue has just appeared is the *Journal of Inorganic & Nuclear Chemistry*, published by the Pergamon Press Ltd., Maxwell House, Marylebone Road, London N.W.1. Edited by Dr. J. J. Katz, of the Argonne National Laboratory, Illinois, Professor H. C. Longuet-Higgins, of Cambridge, and Mr. H. A. C. McKay, of Harwell, the journal has a distinguished editorial advisory board drawn from the US, Britain and the Commonwealth, Austria, Denmark, France, Germany, Netherlands, Norway, Sweden and Switzerland.

The principal interests of the new journal are in theoretical inorganic chemistry on the one hand, and in fission processes and the transuranic elements on the other, but papers can be on any subject embraced by the title of the journal.

The current issue of the *Journal of Inorganic & Nuclear Chemistry* contains contributions from Berkeley University; Harwell; Argonne Laboratory; Wheatstone Laboratory, King's College, London; the French Atomic Energy Commission; Chicago University; Harvard University; Massachusetts Institute of Technology; Institute of Inorganic Chemistry, Berlin; and the Royal Institute of Technology, Stockholm.

Subscription is £4 10s. per volume, including postage; or for individual subscribers certifying that the journal is for their own use, £3 10s.

HRH The Duke of Edinburgh recently opened new buildings at Medway College of Technology, Chatham. Here he is seen after the opening ceremony watching the work of two of the students.

Tools of Modern Science

Physical Society's Exhibition Opens on Monday

TRADITION will be broken when the 39th Exhibition of the Physical Society opens on Monday, 25 April. For the first time in its history the Exhibition will not be held at the Imperial College. Reasons of space have made it necessary to seek larger accommodation, and this year the Society have been fortunate enough to obtain the Royal Horticultural Society's New Hall, Westminster.

The exhibition will be opened to Fellows of the society and representatives of the Press by Professor R. Whiddington at 10.30 a.m. on Monday and will open to visitors at 2 p.m. on the same day, closing at 8 p.m. On succeeding days the hours will be as follows:—Tuesday, 10 a.m.-8 p.m.; Wednesday, 10 a.m.-8 p.m.; Thursday, 10 a.m.-5 p.m. Admission will be by ticket only.

Changes Made

Because of the change of site the exhibition will differ in some ways from those of previous years, but the society hopes that it will still serve to bring before scientists some of the latest developments in scientific apparatus. To this end some 139 organisations are exhibiting, covering every aspect of scientific work. The handbook produced by the society contains comprehensive descriptions of all the exhibits.

Three short discourses or demonstration lectures will be held during the course of the exhibition as follows:—Monday, 6.15 p.m., 'The Free Electron as a Tool in Scientific Research,' by M. E. Haine (Associated Electrical Industries); Tuesday, 6.15 p.m., 'Memory Systems of the Brain,' by Professor J. Z. Young (University College, London); Wednesday, 6.15 p.m., 'Recent Developments in Luminescence and its Applications,' by Dr. G. F. J. Garlick (University of Birmingham). These lectures will be held in the lecture theatre (2nd floor) and are expected to last about 45 minutes.

The entries to the Craftsmanship and Draughtsmanship competition will be on view in the vestibule and prize giving will take place in the lecture theatre on Thursday at 3 p.m.

It would be impossible to give an account of every exhibit but there follows a brief description of some that will be of particular interest to chemists and to chemical industry.

Among exhibits by W. G. Pye & Co. Ltd. (Stand No. 120) will be a miniature *p*H meter which is portable and independent of mains supplies. In industrial plants where a frequent check of *p*H is required much time is wasted in carrying samples to the laboratory and this instrument has been designed to avoid this. The circuit consists of a four valve amplifier with a large degree of negative feedback to give linearity and accuracy. The valves are of the subminiature type having very low power consumption and a robust (high resistance) glass electrode may be used. As well as the more usual applications such as measurements on plating solutions, works effluents, etc., this instrument can be used for the determination of the *p*H of soil.

The Pye miniature pH meter

British Thomson-Houston (Stand No. 105) will be exhibiting glasses made from a variety of unorthodox materials. It has been found that glasses based on calcium aluminate have useful infra-red properties while those based on tellurium dioxide have high refractive index and dielectric constant. Glasses made from vanadium pentoxide are found to be semi-conductors even at room temperatures. Also to be demonstrated by this company is a mercury vapour lamp which provides a comparatively inexpensive source of ozone.

Perhaps the most interesting exhibit by Metropolitan-Vickers Electrical Co. Ltd. (Stand No. 115) will be the vapour phase chromatograph which provides a means for analysing and separating gases and volatile liquids. The sample is injected into the top of a 6 ft. spiral glass column containing keiselguhr impregnated with a high boiling point solvent such as dinonyl phthalate. A continuous flow of nitrogen passes through the column carrying the sample along as a vapour. The time taken for a component to pass through the column is a characteristic for that component. The relative concentration of each component in the nitrogen stream is indicated by a thermal conductivity coil in the outlet line. This concentration is recorded graphically as a series of peaks in the conductivity-time curve. For quantitative work it is necessary to calibrate the instrument first. It is claimed that good separations can be obtained with many different types of mixtures.

Laboratory Equipment

A wide range of laboratory equipment will be shown by Griffin & George Ltd. (Stand No. 92) including the Griffin BDH Water Deioniser. This is a compact all glass unit containing a mixed resin bed 12 in. in depth. Many thousands of litres may be passed through before the bed requires regeneration. A conductivity cell and indicating unit may be added as an accessory to give a continuous indication of the conductivity of the water. Also on show is the autopoise Centrifuge which has a self-balancing head, doing away with the need for any precise static balancing of the centrifuge. The head will accommodate eight 15 ml. or 50 ml. tubes as well as micro and biological tubes.

On show for the first time will be the Mervyn-Harwell Square-Wave Polarograph made by Mervyn Instruments (Stand No. 54). This instrument is unique in that it applies a square wave voltage to the cell. This is superimposed on the normal slow-changing DC potential applied to the cell and enables a derivative type of polarogram to be obtained directly. Three main advantages of square-wave polarography make it suitable for metal-ion analysis. Firstly it is much more sensitive than classical polarography. Secondly, it is extremely simple and thirdly it will deal with mixtures in which the amounts of substances present are not directly related to their electro-chemical potentials. The complete Square-Wave Polarograph is mounted in a double four-foot rack and incorporates its own monitoring system. The whole instrument is extremely easy to operate.

Liquid air can be conveniently prepared in the laboratory using the new gas refrigerating machine developed by Philips Electrical Ltd. (Stand No. 121). This machine, which may be regarded as a heat engine operating in reverse, compares favourably with both the 'cascade' and compression types of refrigerating machine. It will produce liquid air at the rate of five litres per hour within 15 minutes of switching on, and will run continuously for 16 hours in air at a relative humidity of 50 per cent. Total time for de-frosting is one hour including starting time for the next cycle. The plant is driven by a 10 HP motor through a flexible uni-directional clutch. Safety devices are incorporated which close the plant down in the event of failure in the cooling, pressure or lubricating systems.

Apparatus for the measurement, analysis and control of noise will be shown by Dawe Instruments Ltd. (Stand No. 71). The Dawe Type 1408 Sound Level Indicator is a pocket sized instrument, simple to operate, which provides an ideal method of making rapid noise surveys in factories, workshops, etc. The indicator is particularly valuable for taking periodic checks to ensure that improvements in noise level obtained as a result of a detailed acoustical analysis are not lost as additional machines are installed and old machines develop wear. Noise may be reduced at its source by the correct balancing of all moving parts and the Type 1251 Dynamic Balancing Equipment will show both the magnitude and the position of the balancing error.

DSIR Work on Show

DSIR (Stand No. 129) is showing a large number of exhibits covering the whole range of its work. The Hydraulics Research Station has produced a salinity meter which is suitable for measuring the salinity of estuary water. The conductivity and temperature of the water are determined and the salinity is read off from a nomagram. A radio-frequency technique is employed, the electrodes being external to the tube through which the water is pumped. In this way contamination and polarisation errors are avoided. The resistance of the

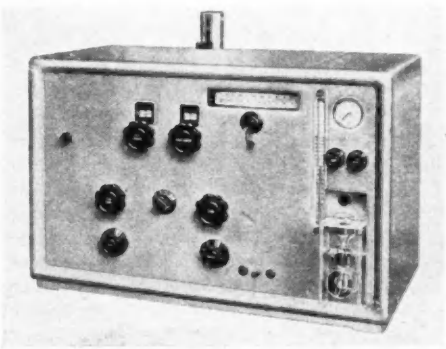
water is balanced against the reactance of a variable condenser, the angular setting of the condenser being proportional to the water's conductivity. The instrument has the advantages gained by using a radio frequency and retains those of the bridge circuits employed in the lower frequency instruments.

The major new exhibit of Unicam Instruments Ltd. (Stand No. 119) will be the flame photometer SP 900. A concentric jet atomiser is operated by an air supply of 24 lb. per sq. in. and feeds a burner using either propane or acetylene. Light from the burner passes into a monochromator of high light-gathering power. A fused silica prism is used which, in conjunction with a photomultiplier and a lead sulphide cell, is suitable for measurements from 250 mμ to 2.7 μ. Radiation leaving the exit slit is chopped at 100 c/s. and focused by a concave mirror to the selected detector. The use of chopped radiation ensures good zero stability. A homodyne rectifier converts the AC output to DC. Readings are taken directly from a spot galvanometer which may be connected to a recorder if required. It is claimed that this instrument satisfies the three basic requirements of a versatile flame photometer which are firstly, stable flame intensity, secondly, a simple and reliable atomiser and sample-handling system, and thirdly, a stable detecting and measuring system.

Speedivac Pumps

'Speedivac' pumps are well known throughout the chemical industry and W. Edwards & Co. (Stand No. 118) will be showing types of vapour diffusion pumps specially adapted for use with the 'Speedivac' vapour booster pump to give high pumping speeds throughout the wide pressure range from 1.0 to 10^{-5} mm. of mercury. Many other interesting high vacuum instruments are also to be shown by this company, including an experimental vacuum arc furnace which permits the melting and coating of refractory metals and alloys at temperatures up to and above 4,000° C. The furnace is suitable for use with both consumable and non-consumable electrodes and employs water-cooled hearths or crucibles. Adequate pumping capacity is provided by a 'Speedivac' model 9B3 booster pump.

An important addition to the range of instruments manufactured by Hilger & Watts Ltd. (Stand No. 106) is the Direct Reading attachment to the Medium Quartz Spectrograph E750. The combination forms a direct reading spectrometer which is simpler and less costly than those hitherto available. It is suitable for the analysis of up to 11 metals in most non-ferrous alloys. Successful analyses have been made of alloys having as base metal aluminium, magnesium and copper, and it has been used for the estimation of additives in oil. Less than three minutes is commonly needed for the analysis of 10 elements. The attachment proper replaces the plateholder of the spectrograph, and it contains slits in the focal plane to isolate the spectral rays required, with individual mirror systems to lead the rays on to individual electric multipliers. Leads connect the attachment to an electric console and during analyses the individual multiplier currents are integrated on their respective condensers. Numerous other features, providing convenience of operation, are provided.



Unicam's SP900 flame photometer

Unsuccessful Appeal

THE BB Chemical Co. Ltd. of Ulverscroft Road, Leicester, manufacturers of the adhesive Bostik, appealed in the Chancery Division recently against the registration of Dustic as the trade mark of a rival product. The appeal was dismissed with costs.

The company claimed that Dustic, for which permission had been granted to R. K. Dundas Ltd., of Bury Street, London S.W., was likely to be confused by the public with Bostik. Mr. Justice Lloyd-Jacob said he had examined the exhibits in the case and to his eye the distinction between the two marks was notably apparent even with representation in not dissimilar forms of print.

Evasion of Customs Duty

Chemical Firms & Directors Fined

FINES totalling more than £15,000 were imposed after a 12-day trial at the Central Criminal Court on two chemical firms and their directors for offences in connection with evasion of Customs and Excise duty. William R. Warner and Co. Ltd., Chiswick, and Piers Grove Eliot Warburton, managing director, were found guilty on three charges of being knowingly concerned in the evasion of duty on Lucosil pure and tyrothricin in August and November 1952 respectively and on Lucosil pure in May 1953. They were found not guilty on two similar charges.

Ward, Blenkinsop and Co. Ltd., Henrietta Place, London, W., and Edward Bruce Ward, director, were found guilty on two charges of making false declarations relating to Customs, one charge of recklessly making an untrue declaration and two charges of being knowingly concerned in the evasion of duty on Lucosil pure in August 1952 and May 1953. They were found not guilty on three charges of being knowingly concerned in the evasion of duty. They were also found not guilty on two charges of making false declarations.

Firms Share Part of Costs

Warburton was fined a total of £4,000, William R. Warner and Co. Ltd. a total of £8,000, Ward a total of £1,250, and Ward, Blenkinsop and Co. Ltd. a total of £2,500. Warburton was allowed 28 days to pay or, in default, 12 months' imprisonment. Ward, in default of payment, was sentenced to six months' imprisonment. Judge Aarvold said he thought some part of the costs should be borne by the companies concerned, and fixed the amount at £1,000, to be shared by the companies.

Mr. Melford Stevenson, QC, prosecuting, said that the duty underpaid amounted to £27,000. For some time, William R. Warner and Co. Ltd., which for all practical purposes was owned by a large corporation in America with a similar name, had imported drugs from H. Lundbeck A/S of Copenhagen and had marketed them under proprietary names in this country. Since 1949 the drugs had been imported through the agency of Ward, Blenkinsop and Co. Ltd. and invoiced at cost. Payment was effected by the payment of the amount of the invoice, plus duty and a commission.

After Warner and Co. had made the drugs into tablets, a royalty of 10 per cent was paid direct to Lundbeck in Copenhagen. These drugs were subject to a duty of 33⅓ per cent on the value in the open market at the time of importation. In calculating this duty, the 10 per cent royalty payable to the Danish manufacturer must be taken into account. The royalty had not been disclosed to the Customs, and the prosecution said that the defendants conspired to conceal that payment and so defrauded or cheated the Customs of duty which would be payable, had it been disclosed.

Mr. F. H. Lawton, for William R. Warner and Co. Ltd. and Warburton, said that his clients had so arranged their affairs that what they did was done in a legal way. In evidence, Warburton said that the 10 per cent royalty paid to the Danish firm was for the 'know how' in relation to the drugs.

Mr. Gilbert Paull, QC, for Ward, Blenkinsop and Co. Ltd. and Ward, said that there was no relationship between the firm and Lundbeck, other than as purchaser and seller, in respect of the Lucosil. Ward said in evidence that he had not known that a royalty of 10 per cent was being paid.

Judge Aarvold said he accepted the fact that 'this particular device' was started originally without any dishonest intention lying behind it. Neither Warburton nor Ward attempted to make any exorbitant profit out of the transactions. Ward had taken a less important part and, though he had committed more offences, the total gain and profit to him was much less.

Plastics Fair for Australia

A plastics fair is planned to take place at Sydney (Australia) Town Hall from 13 to 21 July during a 'plastics week.' Purposes of the fair and the plastics week are to interest the public and increase their awareness of the uses and properties of plastics, to enhance the prestige of the industry and to foster sales. In addition to plastics raw materials and processing machinery, the uses of plastics in various fields will be featured.

The Drying of Iron Pyrites

by F. MOLYNEUX, B.Sc.(Lond.), B.Sc.(Eng.), A.M.I.Mech.E., A.M.I.Chem.E.

THE grave shortage in supplies of American sulphur which occurred towards the end of 1948 resulted in the withdrawal of all Government licences for the building of 'hot gas' contact sulphuric acid plants. Government support was transferred to increasing the production of sulphuric acid either from sterling area or indigenous materials.

In these circumstances the Nichols Freeman process for the flash roasting of pyrites concentrates became a strongly favoured method for contact sulphuric acid manufacture. Due to the method of preparation and transport of these pyrites concentrates it is essential for successful operation of the process that the pyrites be dried to a very low moisture content before roasting.

In Sweden and Finland, where the Nichols Freeman flash roasting process had been in successful operation for some years, this drying had been carried out in a separate rabble hearth on top of the flash roaster itself. This method, however, suffered from the defect that it was not susceptible to fire control and was severely limited in capacity. It was moreover tied up to the operation of the roaster. With these disadvantages in mind it was decided to introduce into the flash roasting process in this country a separate controlled method of drying pyrites fines.

After some preliminary investigation it was decided to adopt the rotary louvre drier as the preferred method for this drying, and the following results and analyses have been obtained on such a drier operating on a production plant basis.

DESCRIPTION OF ROTARY LOUVRE DRIER

The principal features of the construction can be seen from the diagram (Fig. 1). The drier drum is horizontal and is fitted internally with a series of radial plates rivetted and bolted to the shell. These radial plates taper in depth from the feed to the discharge end and are covered as shown by tangential overlapping louvres.

The direction of rotation of the drier is such as to allow the material to slide over the louvres without entering the passages between them. The hot air for the drying operation enters and percolates through the material via these louvre slots. This hot air is fed to the drier via a port and is restricted to those sections of the drier normally covered with material undergoing drying.

The increase in diameter from feed to discharge due to the taper in the longitudinal channels and the rotation of the dryer shell progresses the material to the drier outlet. This reduction in the cross section of the channels also enables the volume of hot drying gas to be self regulating and eliminates the possibility of overheating.

The exhaust gas is pulled through the vanes in the discharge and collecting hood. With dusty materials this exhaust gas is passed through a cyclone before discharge to atmosphere. Hot gas for drying is provided by an oil-fired air preheater.

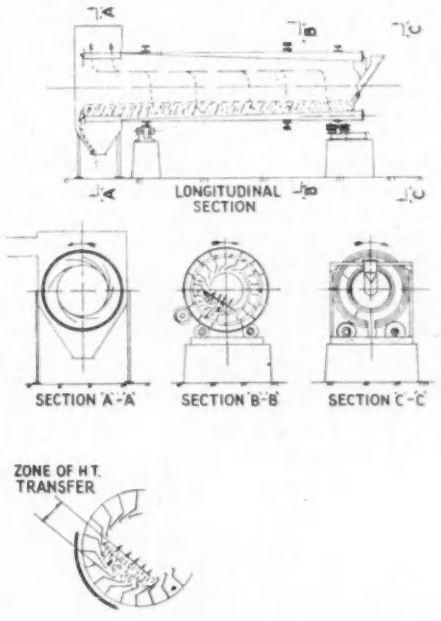


Fig. 1.—Flow of materials and gases through a rotary louvre drier

DRYING OF PYRITES CONCENTRATES

The problems inherent in the drying of fine pyrites are largely associated with the nature of the material itself. Moist pyrites in the finely divided state is both corrosive and abrasive. The moisture content and the particle size distribution vary within fairly wide limits and present a difficult handling problem, particularly at the feed inlet to the drier.

Due to the variable moisture content of the feed it is difficult to maintain accurate control of the moisture in the product, and due to the particle size distribution the quantity of dust liable to pass the dust cyclone is a serious problem. The range of moisture content and particle size distribution is illustrated in the following table.

TABLE 1

Type of Pyrites	Monte-catini	Pysands	Waite Amulet	Solea
Moisture content ..	3.5%	5-6%	8.5%	9-10%
BSS Screen :				
% + 60 ..	89.4	—	51.1	—
− 60 + 100 ..	5.6	29.3	8.4	6.1
−100 + 150 ..	1.8	24.4	13.9	18.9
−150 + 200 ..		9.6		
−200 + 300 ..	3.2	10.6	26.6	17.7
−300		26.1		57.3

The handling problem with this material in a continuous plant is one therefore of prime importance, and has a considerable effect on the efficiency of drying since the feed to the drier must be steady and continuous in order to adjust the thermal variables in the dryer.

The depth and quantity of material in the drier determines the time of treatment. On the rotary louvre drier the retention time may be varied by fitting any of a range of weir plates of varying depth. These control the discharge opening.

An approximate formula proposed by Prutton (1) for the time of retention (T) is:

$$T = \frac{K \times L}{R \times D \times S}$$

e.g. K = for rotary louvre drier = 4.5

L = length = 20 ft.

R = speed in rpm.

D = diameter = 4 ft. 6 in.

S = slope in. per ft. = 0.6.

$$\therefore T = \frac{20\,6 \times 4.5 \times 0.6}{4.5 \times 20} = 1.6 \text{ min.}$$

This is without any weir plate in the discharge hood. With 9 in. deep weir plates the time would be increased to 6½ min. Tests indicate that for this particular drier K = 10 and with 9 in. deep weir plates the retention time is 15 min.

The relative humidity figures achieved on this dryer with pyrites concentrates are around 15 per cent and are somewhat low for maximum efficiency. Due to the presence of pyrites dust in the exhaust gas it is difficult to incorporate recirculation. The relative humidity can be increased by raising the inlet temperature and by increasing the retention time and depth of bed, but in dealing with this material care must be taken in raising the relative humidity to a high value, since this entails a danger of condensation in the exhaust system and a resultant increase in corrosion. There is also the possibility of auto-ignition of the pyrites dust in the exhaust gas due to catalysis by the condensing moisture.

GRANULATION & DUSTING IN THE PRODUCT

The sliding and rotating action of the drier operates in the manner of a granulator on the pyrites feed. This can be seen by an analysis of Tables 2 & 3.

TABLE 2

Dry Screen Analysis of Drier Product

Screen Sizes BSS Mesh	1	2	3	Mean	1	2	3	Mean
+ 20 ..	5	8	6	7	6	5	3	5
+ 40 ..	2	2	3	2	2	2	2	2
+ 60 ..	14	17	16	15	9	11	9	10
+ 80 ..	36	41	43	40	29	39	34	34
+100 ..	5	2	5	4	7	3	4	5
+100 ..	38	30	27	32	47	40	48	45

TABLE 3

Wet Screen Analysis of −20 from above

Screen Size BSS Mesh	1	2
+100	24.1	23.4
+200	41.0	49.44
+300	13.2	7.41
−300	21.7	19.91

This analysis indicates that some 50 per cent of the drier product in the + 100 mesh sizes has suffered some degree of granulation. This granulation reduces the dusting very considerably although the dust discharge to atmosphere of superfines is still 1-3 per cent of the throughput.

An analysis of this dust (Table 4) reveals that this is mainly the superfines in the feed. Chemical analysis indicates also that some classification of material of lower bulk density has taken place in the dryer.

TABLE 4

Dust Burden Inlet Drier Cyclone = 1.66 grains per cu. ft.
Dust Burden Outlet Drier Cyclone = 0.57 grains per cu. ft.

Chemical Analysis of Dust Exit Drier Cyclone

Sulphur = 14.13%
Iron = 15.87%

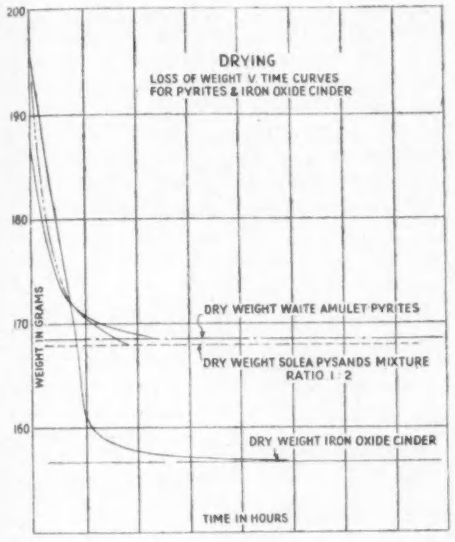


Fig. 2.—Drying rate curves for pyrites and iron oxide cinder

Silica	=	26.75%
Arsenic	=	0.063%
Alumina	=	6.94%
Calcium oxide	=	8.15%

Screen Analysis of Dust Exit Drier Cyclone

90% size 2 microns and below
5.5% size 2 to 5 microns
4.5% size over 5 microns

CONTINUOUS DRYING RESULTS

Drying rate curves for the types of pyrites dried are plotted on Fig. 2, from which it can be assumed that constant rate drying can be achieved down to a moisture content of 0.5 per cent. The drying from this moisture content to the desired figure of 0.2 per cent takes place under falling rate conditions.

Heat supplied by the burner oil	=	2,000,000 BThU per hr.
Heat absorbed by dry pyrites	=	171,000 BThU per hr.
Heat absorbed by drier air (stack losses)	=	2,000 BThU per hr.
Water evaporated	=	565 lb. per hr.
Heat absorbed by evaporated moisture	=	678,000 BThU per hr.
Heat accounted for	=	858,000 BThU per hr.
Thermal efficiency per cent	=	43.0%
Drying efficiency per cent	=	79.0%
Water evaported per lb. fuel	=	5.34 lb.
Drying cost per ton pyrites	=	2s.
Overall heat transfer coefficient	=	20 BThU per hr. per sq. ft. per °F.

CONCLUSIONS & FUTURE DEVELOPMENTS

The results given above on the rotary louvre drier indicate:

(1) The thermal and drying efficiency is excellent.

(2) The heat transfer coefficient is high.

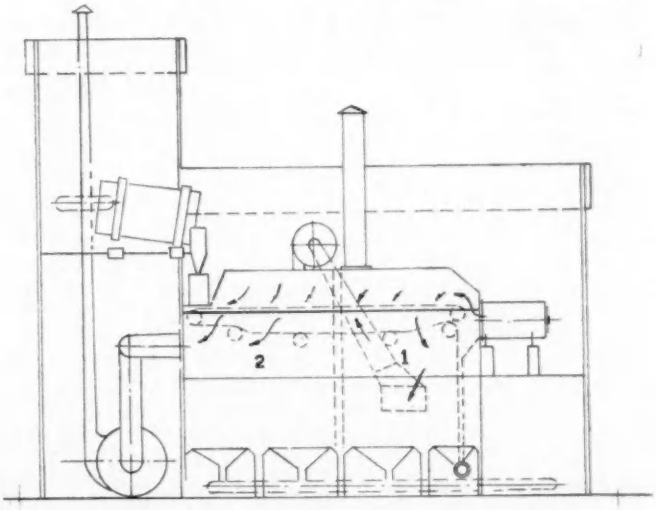


Fig. 3.—Through circulation drier and granulator

(3) Water evaporated per lb. of fuel burnt is high.
(4) The capacity is high and therefore capital cost per unit of throughput is low.

Considerable difficulty is experienced, however, in dealing with pyrites of widely varying moisture and size characteristics. It is suggested that it might be better to preform and predamp in granules the pyrites, for drying on a through circulation drier as illustrated in Fig. 3. With such a controlled feed the product will be easily controlled in size and moisture content. It is probable that by this method the large supplies of high grade pyrites fines resulting from the flotation concentration of copper ores might thus be prepared for roasting by more economical processes than the Nichols Freeman appears to be at the present time.

REFERENCE
(1) Prutton. *Trans. A.I.C.E.*, 1942, **38**, 123.

APPENDIX

Test No.	1	2	3	4	5	6	7	8	9	10	Mean
Feed, tons per hr.	5.6	5.6	4.3	4.3	4.7	3.4	4.7	4.7	3.8	2.9	4.4
Inlet temp.	340C	300C	340	340	360	290	340	350	365	335	336
Outlet temp.	95°C	80°C	95	90	90	95	85	80	76	89	87.5
Suction tertiary ports	0	0	0.2	0.5	0.5	0.4	0.5	0.2	0.5	0.3	0.31
Suction secondary ports	−0.8/ 1.0	0.4	0.2	0.4	0.4	0.4	0.5	0.2	0.5	0.3	0.41
Suction outlet furnace	−0.8/ 1.0	0.4	0.3	0.5	0.5	0.5	0.5	0.3	0.5	0.4	0.47
Pressure outlet fan	4.4	5.2	3.7	—	—	—	—	—	—	—	4.5
Suction hood	−1.2	−1.1	1.0	0.9	0.9	0.5	0.7	0.4	0.7	0.8	0.82
Suction outlet cyclone	−4.0	−3.5	4.0	4.0	3.9	8.0	8.5	8.5	4.1	4.0	5.25
Pressure outlet exhaust fan	+0.1	+1.2	0.10	0.15	—	0.01	0.01	0.02	0.27	0.23	1.11
Amps. O. burner fan	1.12	1.20	1.1	1.2	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Amps. main fan	12.5	15	13.0	13.5	13.0	16.0	14.5	15.0	15.0	17.0	14.5
Amps. exhaust fan	9.2	8	9.3	9.3	9.3	12.0	12.0	12.2	9.4	9.5	10.0
Amps. drier drive	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
Amps. table feeder	3.2	3.2	3.1	3.0	3.2	3.2	3.2	3.2	3.2	3.2	3.1
Amps. conveyor	2	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.20	2.0
Main damper	FO	FO	FO	FO	FO	FO	FO	FO	FO	FO	FO
Exhaust damper	FO	FO	FO	FO	FO	FO	FO	FO	FO	FO	FO
Tertiary ports	1/3	1/3	40%	30%	20%	60%	60%	60%	25%	30%	38.5%
Temp. feed	20°C	20°C	12	12	12	10	10	10	12	12	12.5
Temp. product	90°C	75	90	86	86	89	82	79	70	85	83.2
Exhaust gas wet bulb	42	38	46	46	44	—	—	—	44.5	46	43.8
Exhaust gas dry bulb	97	68	84	83	82	—	—	—	7.45	84.5	82
Gas volume c.f.m.	4,100	3,900	4,320	3,850	4.450	4,230	4,280	4,450	4.060	4,750	4.239
Feed inlet moisture	4.44	3.25	6.72	7.48	8.16	5.6	5.0	5.2	7.24	6.84	6.0
Feed product moisture	0.22	0.17	0.04	0.06	0.26	0.41	0.42	0.47	0.49	0.23	0.27
Oil consumption gal. per hr.	11½	10.4	11.6	11.6	12.2	10.4	12.2	12.0	11.6	10.4	11.4

Bowmans Celebrate

INSCRIBED tankards were presented to all male employees at a dinner and social evening held at Liverpool recently to celebrate the 50th anniversary of the founding of Bowmans Chemicals Ltd. Women received inscribed cream jugs.

The dinner was attended by 200 employees and their wives, as well as a number of retired employees and other guests. A toast to the company was proposed by Mr. E. G. Turner, M.C. (chairman), and responded to by Mr. S. H. W. Pert, M.C. (managing director). Mr. W. H. Bellamy (sales director and former secretary) proposed a toast to the visitors.

A silver cigarette box was presented on behalf of all employees to Mr. Pert by Mr. J. D. Derbyshire, the longest serving employee, who has been with the firm for 35 years. Mr. Derbyshire himself received a gold watch and chain from Mrs. Pert.

Blickvac Redesign

BLICKVAC ENGINEERING LTD., Bede Trading Estate, Jarrow, announce the redesign of their range of high vacuum and pressure impregnation plants. In the new range of models all controls have been centralised, and control has been made so easy that the plant can be operated by either a semi-skilled or a disabled person.

Great care has been taken to ensure that all pipe-lines are easily demountable to facilitate cleaning, and the pipe-line assembly is 'floating' to avoid all risk of fracture.

The double units (with two autoclaves and two storage chambers) are, of course, more economical to operate and the plant and control panel are specially designed so that a second autoclave and chamber can be added to a single unit at a later date as soon as the volume of work warrants it.

Specially adapted plants are available for use with epoxy and other potting resins.

Electro-Precipitation of Flue Dust

Investigation of Factors Concerned

RESEARCH carried out by J. R. A. Lakey, Ph.D., A.Inst.P., and W. Bostock, B.Sc., both of Simon-Carves Ltd., Cheadle Heath, Stockport, has led to a better insight into the factors affecting the electro-precipitation of fine particles in gaseous streams. This was made clear in a paper presented to the North Western Branch of the Institution of Chemical Engineers at the College of Technology, Manchester, on Saturday 16 April.

The process of electro-precipitation takes place in two stages which are normally combined into one. An electric charge is first induced on the particles and then the particles are removed from the gas stream under the influence of a lateral electric field. The most popular system for the collection of dry solids is the multi-wire parallel plate precipitator and only this one was considered by the authors. The first essential for efficient precipitation is a strong corona discharge, which depends on the geometry of the electrodes and the temperature and humidity of the atmosphere. It is not possible to give a rigorous mathematical treatment of the discharge characteristics of a multi-wire parallel plate system and it is necessary to use models. One such model consisted of two receiving electrodes 20 cm. by 10 cm. with discharge electrodes set in a plane midway between them. In this way it was found that the discharge was unaffected by the material of the wires. It is necessary to insert a load resistance in order to protect the power unit and the value of this resistance must be carefully chosen to suit the particular characteristics of the precipitator.

Method of Measuring

The effect of the distance between wires relative to plate spacing was measured in the following manner. The plates were raised to a high positive potential and the wires were led to earth via a micro-ammeter. In this way the discharge current could be measured for individual wires. The discharge current decreases with an increase in wire diameter but increases with an increase in wire spacing. These laboratory experiments show that the discharge characteristics of a wire-plate precipitator can be modified by changes in the configuration of the electrodes. So many unknown factors are involved, however, that laboratory results cannot yet be scaled up to full size.

Affects Precipitation

The resistivity of a powdered material has an important bearing on the ease or difficulty with which that powder may be precipitated. Materials with apparent resistivities above about 2×10^{10} ohm cm. are said to produce the effect known as back discharge or reverse ionisation. This finally leads to spark-over in the precipitator. For materials with resistivities below about 10^4 ohm cm. ready re-entrainment into the gas stream occurs and no practical methods of precipitation are at present available. The authors have made a careful study of methods of determining resistivity. For significant results to be obtained it is necessary that the sample should be deposited electrically and for this purpose a piece of apparatus known as a 'race track' was used. Air is circulated round a closed circuit by means of a paddle-wheel fan. Dust is introduced and passes an inspection chamber containing a small point-plate precipitator. When a suitable layer of dust has been precipitated on the plate another plate is lowered on to it and the resistivity of the specimen is measured. The temperature and humidity of the system are controlled. A more convenient refinement of the method is to use a grid supported above an earthed plate. Dust is precipitated through the grid until the layer formed touches the grid. The discharge current and the potential on the grid are both measured and the resistivity of the sample calculated.

Both these methods may be criticised on the grounds that they do not represent truly the conditions of the actual plant. Accordingly an apparatus was designed in which the resistivity of the sample was measured *in situ*. The effect of changes of bulk density was also investigated. It was found that changes in resistivity produced by changes in bulk density were negligible compared with changes due to other factors.

The effect of temperature on the resistivity of precipitated flue dust was examined.

Initially the resistivity rises with rising temperature, reaches a maximum between 100 and 200° C and then begins to fall steadily. Hysteresis effects were noticed when the sample was cooled.

The accumulation of dust on the electrodes is a serious problem in electro-precipitation. Investigations by the authors seem to show that barbed electrodes would be least affected by this accumulation. Results from work on the phenomenon of back discharge are incomplete and seem to be contrary to those obtained by previous workers.

Experiments were conducted with a view to preventing re-entrainment. It was shown that this can be limited by arranging suitable projections on the receiving electrodes. It was also shown that larger particles are more readily re-entrained, a result in accord with theoretical considerations.

In conclusion the authors said that they had covered some of the practical problems connected with electro-precipitation but there were many of a more fundamental nature which warranted investigation. Among these were: migration velocity related to particle size for various discharge characteristics, effect of gas composition and gas temperature on ionic mobility, and the measurement of electric field strength under dust-laden gas conditions. It was on these problems that future efforts would be concentrated.

Finally some advice was given on points of design. A protective resistance is normally incorporated and the value of this must be carefully chosen, bearing in mind all the factors involved. Other important points to be considered were the resistivity, composition and particle size of the dust.

The authors expressed their indebtedness to Mr. J. G. Topping for his assistance with the experimental work. The paper was published by permission of Dr. W. Rheinallt, Director of Research, and the Management Board of Simon-Carves Ltd.

IN THE EDITOR'S POST

Pegs & Holes

SIR,—How happy I was to read your cogent leader in answer to that very odd dissertation in *Chemistry & Industry* (THE CHEMICAL AGE, 1955, **72**, 839). While I could cover pages on the subject, I should like simply to raise a single point. Referring to the subject of 'good managers' and the greater rarity of scientific ones: in my, not inconsiderable, experience of industry, managers are raised by long, or perhaps short and nepotistic, experience. Have they any scientific achievements they are quick to disclaim them.

As a general rule the scientist is the last to receive consideration for a managerial post, not because of his relatively greater value elsewhere but because of his 'science.' It is fashionable nowadays for top executives to deny any knowledge of 'stinks' or of 'professional electricians.' If, through lack of any sort of promotable material at all, a scientist is, of necessity, raised to board level, it is in nearly every case at a junior level of status and salary.

This, I believe, is due to the remarkable ease with which a science degree can be obtained, by grant or by evening class study and to the consequent low standard of salary which such graduates are prepared to accept. In support of this, perhaps rather sour, comment, may I ask your readers to consider the number of Public School scientists that they can name in contrast to the number of those fortunate gentlemen in managerial posts?

Yours faithfully,

'DISILLUSIONED.'

(name & address supplied).

Ickenham, Middx.

* * *

Scientific Glassware

SIR,—I have been asked by the British Lampblown Scientific Glassware Manufacturers' Association to prepare a history of the British Lampblown Scientific Glassware industry concentrating in the main on the last 200 years. The industry is, of course, concerned with the manufacture of scientific apparatus by hand, but also covers the production of tubular glass containers and other glassware by machinery.

I would much appreciate any help which your readers could give in the provision of information about the history of scientific glassware and the companies within the industry over the last 200 years.

Yours faithfully,

D. RIDER.

19 Portland Place,
London W.1.

Salaries for Chemists

BAC Recommendations

RECOMMENDED Scale of Minimum Salaries for Chemists and Chemical Assistants' published by the British Association of Chemists contains suitable salary and increment scales for all grades of chemical staff. It is pointed out by the Association that these are only regarded as minimum salaries and it may be necessary for considerably higher rates to be offered in certain cases in order to attract the better type of chemist or assistant.

For the purposes of simplicity the scales show rates appropriate for those recruited into and remaining in each particular grade. Promotion into a higher grade should not involve any decrease in remuneration as it will be found possible to select an appropriate point of entry into the new grade.

Fixed Annual Increments

Junior and laboratory assistants should receive fixed annual increments together with awards for successful examination results. These should be regarded as mandatory if the assistant is competent and zealous.

Adoption of these scales does not prejudice the right of an employer to withhold all or part of any increment to a chemist or assistant whose work is not up to standard. In such a case the reasons should be given to the person concerned and no objection raised if he decides to seek alternative employment.

The position of senior chemists is somewhat different and for such posts individual agreements of service are more appropriate. It is suggested that all such agreements be submitted to the BAC before signature. Legal advice covering this and other aspects of professional work is provided free to members of the BAC.

The following is a summary of the recommendations of the Association. A qualified chemist with an honours degree and two years' post-graduate experience who is not less than 25 years old should receive not less than £750 per annum. If he has had no post-graduate experience but is over 23 years of age he should receive £630 per annum. The corresponding minima for chemists with pass or general degrees or Higher National Certificate are £630 and £530 per annum respectively. Annual increments of £60 per annum for the higher grade and £50 per annum for the lower grade should be made for the first five years and afterwards according to merit. Chemical assistants with Intermediate B.Sc. or Ordinary National Certificate and less than four years' experience should recieve £375 per annum while those with over four years' experience should receive a minimum of £475 per annum. Annual increments of £25 and £30 per annum respectively should be given for the first five years. Junior assistants and laboratory assistants up to the age of 26 should receive a minimum salary of £195 per annum at the age of 16 with increases of £26 every year. After the age of 26 increments should be given on merit and ability. Junior assistants under the age of 21 should be allowed eight hours per week with pay for part-time education. Many firms extend this privilege up to the stage of obtaining a degree or A.R.I.C. Evening studies will usually be necessary in addition.

It is suggested that three weeks annual leave with pay is appropriate for qualified chemists and two weeks for other grades. This is of course in addition to the normal public holidays.

The publication concludes by suggesting a suitable formula for calculating the bonus paid to shift workers. When a chemist has to work for longer hours than are normal for the industry some suitable extra remuneration calculated on a recognised overtime basis should be given.

The BAC emphasise that these scales apply equally to both sexes.

Lithium Salts

Fisons Ltd. announce that they now represent the Foote Mineral Company of Philadelphia for the sale of lithium salts in the UK and Europe, including Scandinavia. Sales in the UK are being handled by Whiffen & Sons Ltd. and overseas by Fisons Chemicals (Export) Ltd., both of North West House, Marylebone Road, London N.W.1, from whom samples, prices and details of availability may be obtained.

Stearic Acid Substitutes

South African Plant Operation

SEVERAL different grades of stearic acid substitute are now being manufactured in a new plant situated near Simonstown in the Cape Peninsula. The raw materials are imported tallow and local marine oils obtained from the fisheries along the West Coast of the Union.

The process of manufacture consists of oil purification, hydrogenation and subsequent fat splitting by the autoclave method using a catalyst. Conventional hardening methods are followed using a nickel catalyst and hydrogen which is generated at the factory in a battery of electrolytic cells. Fats of a very low iodine value are thus produced which are then split in a stainless steel autoclave at working pressures up to 150 psi using a small amount of catalyst to accelerate the splitting rate. Fatty acid stock produced is separated and treated for removal of metallic soaps and other impurities. A point of interest is that the autoclave, capable of handling batches of several tons, was manufactured in the Union by a Johannesburg firm of chemical engineers and illustrates the progress made in South Africa during recent years in the fabrication of stainless steel pressure vessels for chemical manufacture.

Purified fatty acids are chilled on a flaking roll to produce the stearic acid in flake form ready for packing in multi-wall paper bags. Careful control of the process ensures consistent quality and several fatty acid grades can be supplied to rigid specifications as to colour, titre, etc.

These fatty acids have rapidly become popular in the Union's rubber compounding, grease and chemical industries. The new product has replaced stearic acid hitherto imported for manufacture of tyre rubber, metallic stearates and similar compounds.

Fool's Paradise?

Britain Lagging I.Chem.E. Told

SPEAKING at the annual dinner in Birmingham of the Graduates' and Students' Section of the Institution of Chemical Engineers on 16 April, Mr. J. Wilson, Principal of Birmingham College of Technology, said that after studying productivity methods in the USA and Germany recently, viewing the chemical engineering industry, he had come to wonder whether Britain was 'living in a fool's paradise, in need of a good shaking up.'

Mr. Wilson said that while Britain still appeared uncertain about theories on higher productivity, the Germans and Americans were approaching the problem realistically, and factory progress in Germany had become 'quite frightening'. He had found that the Germans were making surprising headway with plans for training chemical technologists and the universities of the United States were now turning out 3,000 chemical engineers a year.

He advised chemical engineering firms to think less of the Royal Institute of Chemistry and more of the Institution of Chemical Engineers, whose policy was to go beyond pure chemistry issues and on to the practicalities of industrial management problems and techniques.

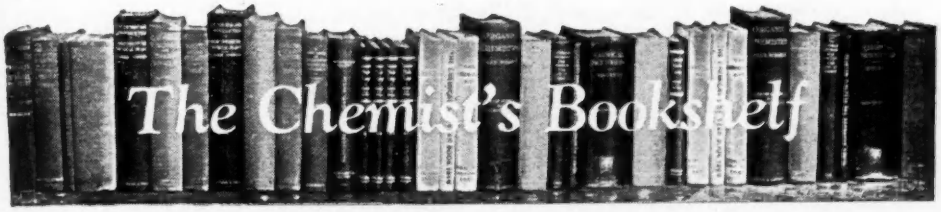
Birmingham College of Technology, Mr. Wilson said, planned to help training difficulties by introducing special 'sandwich' courses on chemical engineering, designed to be complementary to university courses rather than competitive.

Mr. R. J. Kingsley, chairman of the Manchester centre of the Institution, said that in this country, especially in chemical engineering, we were still too dependent for 'know how' on America and other sources. 'We have the ideas, and we probably have the right number of university-trained people, but we need more non-commissioned officers in the industry if we are going to stand on our own feet', he went on.

Mr. Kingsley also suggested a change in the country's investment policy. Risk capital of the kind available for financing new development elsewhere must somehow be created.

Infra-Red Spectroscopy

Two integrated one-week courses in infra-red spectroscopy are to be held from 18 to 29 July at the Massachusetts Institute of Technology. The programme, offered jointly by the Institute's Spectroscopy Laboratory and Department of Chemistry, is designed for those who wish an introduction to infra-red instrumentation and laboratory methods and for those interested in the use of infra-red spectra in the solution of chemical problems.



MARGARINE. By A. J. C. Anderson. Pergamon Press Ltd., London. 1954. Pp. 327, 105 illus. 63s.

In a previous monograph on 'Refining of Oils & Fat' Mr. Anderson described the methods by which fatty raw material was refined to make it suitable for use as edible oils or margarine. In the present book the processes used in the manufacture of margarine are described in detail with particular reference to the types of machinery used and the chemical engineering operations involved. The seven parts of the book deal respectively with History, Raw Materials, Manufacturing Processes, Storage and Preservation, Process Control, Margarine Legislation and Factory Plans. Part III, Manufacturing Processes, the largest section, deals with Emulsification, Cooling and Crystallisation, Tempering, Kneading and Rolling, a variety of continuous processes, and finally with packaging and wrapping. Each process is described in detail with the necessary theoretical background and with full drawings and illustrations of all equipment used. The specialist in the margarine industry will find a great deal of information on process conditions and operating techniques and the book should provide a valuable source of reference. The chemical engineer, not directly concerned with the manufacture of margarine, will appreciate the detailed account of a number of chemical engineering operations which because of their specialised nature are not normally dealt with in text books on unit operations.

Both chemists and engineers will enjoy reading this account of the history and development of the margarine industry and will doubtless be surprised at the variety of operations necessary in the production of this material.

The high standard of illustration and writing set in the author's previous book have been maintained in this text. The book is well produced, adequately indexed and printed on good paper. At first sight the price seems rather high, but it is excellent value for money.—F.M.

PROCEEDINGS OF THE CONFERENCE ON OXIDATION PROCESSES (Amsterdam 1954). Pergamon Press Ltd., London. Pp. 135. 35s.

This special supplement to *Chemical Engineering Science* includes the 11 papers presented at a Conference on Oxidation Processes held in Amsterdam in May 1954 together with Professor H. I. Waterman's introduction, the closing address by Professor F. H. Garner, and reports of the discussion on each paper.

Oxidation processes are already of considerable importance in industry in spite of the fact that the oxidation of hydrocarbons leads to the production of a variety of substances with the resulting problem of separating these. It seems quite likely that oxidation processes will become of even greater importance. Who would have thought on reading the original paper of Hock and Lang in 1944 on the preparation and decomposition of cumene hydroperoxide, that within a few years a most important industrial process for the manufacture of phenol would be based upon the decomposition of this hydroperoxide? Combustion processes have received much attention in recent years but this aspect of oxidation was not dealt with at the present conference although one paper (dealing with the BASF process) involves a combustion mechanism. For many years the possibilities of the large scale use of oxygen and the production of this so called 'tonnage oxygen' have stimulated discussion and research; some attention is paid to this in the present publication.

The first paper by G. H. Twigg discusses the liquid phase oxidation of paraffins and olefines in terms of the free-radical chain mechanism proposed by Bolland and his coworkers. Much work has been carried out on liquid phase oxidation in recent years and it is now well known that the formation of

a hydroperoxide is an important step in this type of oxidation; in the case of paraffin hydrocarbons, ketones are believed to result from the further reactions of this hydroperoxide. Epoxides have been found to be a major product of olefine oxidation. The metal catalysed oxidation of acetaldehyde is also briefly discussed in this first paper.

In the later papers more stress is laid on the process side. G. Wietzel deals with the manufacture of fatty acids by the oxidation of paraffin hydrocarbons with molecular oxygen, and the mechanism of the oxidation is discussed. (This paper is in German). The process involves the oxidation of the liquid paraffin at 110° C in the presence of a catalyst until about one third is transformed into fatty acids. Details are given of the installations for large scale production.

M. B. Donald and J. R. Grover report upon a laboratory study of the effect of added cyclohexane upon the air oxidation of benzene. The mechanism of this is interesting but the yields of phenol are low. The oxidation of benzene, toluene, naphthalene and anthracene in the presence of vanadium oxide catalysts using a fluid bed of uniform temperature is discussed by P. Mars and D. W. van Krevelen. These workers also discuss an equation by which data on the oxidation of sulphur dioxide by means of a vanadium pentoxide catalyst may be described. As already mentioned an important process for the production of phenol and acetone is based upon the decomposition of cumene hydroperoxide. J. P. Fortuin and H. I. Waterman discuss the preparation of this by the liquid phase oxidation of cumene (isopropylbenzene) with molecular oxygen. The kinetics of the reaction are discussed.

R. M. Cole, A. W. Fairbairn and K. D. Detling report upon a process for the manufacture of *p-tert.*-butyl-benzoic acid while A. F. Lindsay deals with the nitric acid oxidation of cyclohexanol and cyclohexanone to adipic acid which, of course, is a vital material in the synthesis of nylon. The design of plant is considered and corrosion data are presented in the latter paper.

The remaining papers deal with rather different topics. E. Bartholomé discusses the BASF process for the production of gaseous acetylene by the partial oxidation of gaseous hydrocarbons. The process merely uses the exothermic combustion reactions in a flame to provide suitable conditions for the endothermic formation of acetylene, with rapid quenching of the flame to preserve the acetylene. W. J. B. Chater reviews the extent to which oxygen has replaced iron ore and air in post-war iron and steel-making while the provision of oxygen for industrial processes is discussed by A. M. Clark. Developments which have made 'tonnage oxygen' possible are outlined in the latter paper. F. J. Dent in the last paper discuses the use of oxygen in selected gasification processes and considers the advantage which this offers in enabling low grade fuels to be gasified.

The papers are well-printed and include many diagrams and several plates depicting technical plant; they are, however, only in paper covers.

This set of papers is valuable in giving to the chemist and chemical engineer an overall picture of the use of oxidation processes in industry. It is to be regretted that almost a year should have elapsed between the conference and the final publication of the papers with the discussion.—R. LONG.

New Plant in Venezuela

A SITE in Morón, near Puerto Cabello, is being acquired for the construction of a petrochemical plant, to be completed by the middle of 1957, and in full running order by 1960. Total cost is estimated at about £10,000,000. Production will include up to 150,000 tons of fertiliser, 5,000 tons of chlorine, 5,000 tons of caustic soda, and 5,000 tons of nitroglycerine. These will subsequently be followed by synthetic fibres, detergents, synthetic rubber, and many other petrochemical products.

The main interest at present is the production of fertiliser for further agricultural development and because the cost of imports is too high for the average farmer. Imports were only 18,000 tons in 1954, but it is expected that, with lower prices of the home produced fertilisers total consumption should easily reach 150,000 tons or more a year. The site chosen is well placed for rail and water transport, and for supplies of oil and gas. New railways and pipelines are to be constructed, and an oil terminal will soon be established in the Puerto Cabello district. The first building, already erected, is being used for the surveyors and engineers of the Ministry of Mines & Hydrocarbons.

HOME

Visit to GEC Laboratories

The General Electric Co. Ltd. have invited members of the Parliamentary and Scientific Committee to visit their research laboratories at Wembley on 3 May.

Borax Move to New Offices

Borax Consolidated Ltd. move to their new offices on 25 April. Their address will be Borax House, Carlisle Place, London S.W.1. Tel.: VICtoria 9070-9. Telegrams: Colemanite, Telex, London. Cablegrams: Colemanite, London (Telex 2-2065).

High Output Rise

In the seven years from 1948 to 1954 output per man increased by an annual average of 8 per cent in the chemical industry. This was the highest figure of any industry and compares with an annual increase of 3 per cent for manufacturing industry as a whole.

Pipeline Contract for British Firm

The London firm of Costain-John Brown Ltd. and the French firm, Entrepose, have jointly been awarded a contract worth £11,500,000 to build an oil pipeline for the Iranian National Oil Company. The pipeline, from Ahwaz, 60 miles north of Abadan, to Teheran, will link the oilfields with the capital's industries. It will be 580 miles long. The British contract is worth £6,500,000, and Costain-John Brown are laying the southern section, 340 miles long.

Steel Output Still Rising

The Iron and Steel Board announces that steel production in March averaged 394,900 tons a week. This compares with an average of 394,200 tons in February, which was the highest rate previously achieved. Steel production during the first quarter of the year totalled 5,074,000 tons, compared with 4,694,000 tons in 1954.

Open Days at BCURA

The British Coal Utilisation Research Association at Leatherhead will hold Open Days from 8 to 10 June. Wednesday 8 June will be reserved for members and their friends. On 9 and 10 June the laboratories will be open to visitors from professional organisations, public authorities, other research associations, schools, etc.

Duke to Open New Laboratories

The Duke of Edinburgh will open the new research laboratories of the British Rayon Research Association, Heald Green, Wythenshawe, Manchester, on 11 May.

No Subsidy on Potash

Sir Alfred Bossom (Con., Maidstone) asked the Minister of Agriculture recently whether consideration would be given to granting a subsidy on potash used for agricultural purposes. Mr. D. Heathcoat Amory, in a written answer, replied: 'My Department has considered the possibility of a subsidy on potash from time to time, but the balance of arguments so far has been against it.'

Smoke Abatement Society Moves

The National Smoke Abatement Society has moved from its offices in Grosvenor Place, London, and its new address and that of *Smokeless Air* (editorial and advertising) is: Palace Chambers, Bridge Street, London S.W.1. Tel.: TRAfalgar 6838-9.

Social Research in Industry

A meeting of scientists engaged in social research in industry is being held at York from 23 to 27 April. The gathering has been arranged jointly by the Acton Society Trust and the York Civic Trust, and the scientists, all of whom are engaged in studies of the behaviour of individuals or organisations in industry, are expected from nine countries of Europe.

Plant for Sulphuric Anhydride

The first plant of its kind in Britain to produce stabilised sulphur trioxide is to be built by Hardman & Holden Ltd. at their Clayton (Manchester) works in agreement with the Allied Chemical and Dye Corporation of America. The chemical is better known as sulphuric anhydride in this country. Building is anticipated in 1956.

British Plant for NZ

The heavy water plant to be erected in New Zealand's North Island (see THE CHEMICAL AGE, 1955, **72**, 549) will be manufactured by Head Wrightson Processes Ltd., subsidiary of Head Wrightson & Co. Ltd., of Thornaby-on-Tees. The firm are heavy water consultants to the Atomic Energy Research Establishment.

• OVERSEAS •

Canada's Plastics Output Soars

In five years the gross value of the output of Canada's plastics products industry jumped from $12,716,000 in 1947 to $33,585,111 in 1952.

US Carbon Black

Daily average shipments of furnace blacks in the USA were 12 per cent higher in February than in the previous month, while shipments of contact blacks were down by 10 per cent. Total shipments were 26 per cent greater than in February 1954. Stocks declined by 15,000,000 lb. during the month.

American Aluminium Output

Domestic production of primary aluminium in January totalled 128,203 short tons, according to the Bureau of Mines, United States Department of the Interior. Reynolds Metals Company and other firms announced a price increase of 1 per cent per pound on primary aluminium pig and ingot. The new base prices of primary (99+ per cent pure) ingot and (99 per cent average) pig were 23.2 cents and 21.5 cents per pound respectively.

Roumania to Produce Kapron

Manufacture is to start this year in Roumania of Kapron-type synthetic fibres, produced from indigenous raw materials. Kapron was first made in Russia some years ago, and its uses are said to be similar to those of nylon. In Roumania production will be on what is described as 'a semi-industrial scale'. The Laboratory of Synthetic Fibres in Bucharest is also working on the production of fibres to replace wool.

Nuclear Reactor for Holland

Professor H. Brinkman, the Director of the Dutch Physics Laboratory at Groningen, speaking at the recent opening of the mobile exhibition 'The Atom, Hope of the Future', said that he expected Holland's first experimental nuclear reactor to be ready in about two years. It is to have a capacity of 10,000 kilowatts, and is intended mainly for further research work. After another five years, continued Professor Brinkman, it might be expected that the first reactor in an electrical power station might be ready.

US Nickel

Consumption and imports of nickel in the US in January were each 6 per cent larger than in December, according to the Bureau of Mines, United States Department of the Interior.

Canadians to Exhibit at Brussels

An example of Canada's increasing export trade in chemicals is the fact that 20 firms are to be represented in a Canadian chemical display at the Brussels International Trade Fair (23 April to 8 May). This is the first time that such a comprehensive exhibition of Canadian chemical products has been organised for a European trade fair.

Nylon in Australia

British Nylon Spinners Ltd. have bought a site of 92 acres in an outer suburb of Melbourne and hope to begin production of nylon there within three years. The plant will cost about £3,000,000. The Australian subsidiary company will be the first overseas venture of British Nylon Spinners, which is owned by Courtaulds and I.C.I.

Match Handicap

West European match manufacturers are meeting increasing competition from Iron Curtain countries. According to Otto I. Frölich, managing director of the Norwegian firm Bryn-Halden & Nitedals Tændstikkfabrik, countries like Poland and Czechoslovakia 'are exporting matches at prices which in our view bear no relationship to normal production costs. Eastern European matches are being sent over most of the world at a price, including freight and insurance, of 2s. 6d. a gross, while our lowest price is 4s. 5½d. f.o.b.'

Tall Oil Association Reorganised

At the recent annual meeting of the (American) Tall Oil Association a complete reorganisation was effected. A new parent association, The Pulp Chemicals Association, was formed, and the former Tall Oil Association became the Tall Oil Division of the new Association. A Sulphate Turpentine Division and a (Tall Oil) Fatty Acids Division were also formed. The new association has been organised so that additional divisions can be readily brought into being to handle the problems of other chemicals.

· PERSONAL ·

MR. STANLEY RAISTRICK has been appointed a director of Anchor Chemical Co. Ltd.

Manchester University are to confer on 11 May the honorary degree of D.Sc. on DR. WILLIAM HUME-ROTHERY, O.B.E., M.A., Ph.D., D.Sc., F.R.S., Warren Research Fellow of the Royal Society and Lecturer in Metallurgical Chemistry at Oxford University.

MR. J. RUTTER has been appointed a technical representative of The Jenolising Co. Ltd., manufacturers of phosphating processes, and is at present undergoing intensive training in their Rathbone Street, W.1, laboratories. Previously he was preparing and controlling painting specifications for the Commonwealth Government in Sydney, Australia, and he brings to his new appointment a wide knowldege of paint technology, based on 20 years' experience in the paint industry.

It has been announced that VISCOUNT WEIR of Eastwood has decided to retire from office as chairman and director of Messrs. G. and J. Weir Ltd., engineers, Holm Foundry, Cathcart, Glasgow, as from the date of the forthcoming annual meeting. In recognition of his long association with the company, extending over 57 years, the board propose that he be appointed the first honorary president of the Weir group of companies. On the retirement of Lord Weir the HON. J. KENNETH WEIR, the present managing director, should, the directors propose, be appointed chairman, and it is also proposed that the position of managing director be held jointly by Mr. Weir and MR. J. RUSSELL LANG. Lord Weir, who is 77, has seen the Weir enterprise develop from its early years until the products of the group are known throughout the world. The assets of the group now exceed £10,000,000.

MR. R. V. WADSWORTH, F.R.I.C., has retired from his position as chief chemist to Cadbury Bros. Ltd., in whose service he has spent nearly 41 years. He is remaining as a consultant.

DR. EDWARD LEIGHTON YATES, senior lecturer in physics at Sheffield University, has been appointed to the chair of physics at the University College of Rhodesia and Nyasaland. He is expected to take up the appointment in November. Dr. Yates has carried out research on iron-nickel alloys and has adapted X-ray technology to the examination of metal crystals under strain.

MR. JAMES EWING, chairman and joint managing director of the Bradford Dyers' Association, has been appointed president of the Textile Finishing Trades Association in succession to MR. N. G. MCCULLOCH. MR. WILLIAM CROSSLEY, managing director of the Yorkshire Dyeing and Proofing Co., has been appointed chairman of the commercial and industrial section.

Witco Chemical Company Ltd. announce the appointment of MR. MAX A. MINNIG and MR. JOHN A. WHITE as directors of the company.

MR. R. G. GALGUT, personnel officer at the Stone (Staffs) factory of Quickfit & Quartz, Ltd., makers of interchangeable laboratory glassware, a member of the Triplex Group of Companies, has left to take up a similar appointment with Hoover, Ltd., in London. He has been succeeded by MR. B. COOMBES.

The following appointments have been made at I.C.I. Dyestuffs Division: MR. J. C. A. CHIVERS, previously works manager at Trafford Park, has been appointed to a similar position at Huddersfield Works; MR. J. B. KITCHIN, previously assistant works manager at Grangemouth, is now works manager at Trafford Park in succession to Mr. Chivers; MR. G. R. UNDERWOOD has succeeded Mr. Kitchen as assistant works manager at Grangemouth: he was previously head of the naphthalene intermediates department at Huddersfield: he has been succeeded by MR. D. A. W. MACPHERSON, former head of the resins department at Huddersfield; MR. C. K. STEINGOLD is now head of the resins department at Huddersfield. The Division Work Study Officer, MR. H. W. DEANS, has left the Division to take up a similar post with

Scottish Agricultural Industries Ltd. He has been succeeded by MR. A. G. REES, previously head of department, East Area, Trafford Park Works. MR. A. L. FALLOWS now holds this appointment.

ALDERMAN EDWIN THOMPSON is to retire next month from the Liverpool City Council after 40 years' continuous service as a member. Alderman Thompson is governing director of Thompson and Capper, Wholesale, Ltd., the Liverpool manufacturing chemists, founded by his grandfather in 1798. A native of Liverpool, his connection with the City Council began in 1915. For many years he was chairman of the Water Committee and it was very largely due to his efforts that Liverpool secured its third pipeline from Lake Vyrnwy. His services to the city were recognised by his election as Lord Mayor in 1930, and he was president of the British Waterworks Association in 1931-32. Two years later he became president of the Society of Chemical Industry, and in 1944-45 he was High Sheriff of Lancashire.

Obituary

Sunvic Controls Ltd. announce the death recently of MR. G. R. PEEKE, 117 Stratford Road, Birmingham, their Midlands representative for scientific and industrial products. For the time being all inquiries and correspondence should be addressed to the company at No. 1 Standard Factory, Eastern Industrial Estate, Harlow, Essex.

Responsible Monopoly

REPUTATION, not profits, was the first essential of a concern like I.C.I., Mr. P. Mayne, I.C.I. Billingham technical director, said when presenting long-service awards last month. If the firm were to start charging exorbitant prices, their good name would suffer, he added.

Mr. Payne said that in I.C.I. monopoly meant only one thing for the commercial, technical and production men—responsibility. 'And we know that if you want to make yourself prosperous by exploiting monopolies, you are bound to fail.'

Mr. Payne pointed out that I.C.I. was the only producer of methanol in the country, and since the war the demand for it had soared. It was because the firm had kept the price reasonable that the demand had risen. Anybody could make methanol, but if they wanted to enter into the manufacture of it they would have to do so on a colossal scale.

UK Exports for Oil Group

IN 1954 the Royal Dutch/Shell Group of oil companies exported £30,000,000 worth of stores and materials from the UK to areas engaged in the production, refining and marketing of oil all over the world. Substantial sums, running into many millions of pounds more were spent on the upkeep and improvement of refineries and chemical plants in the UK and for the building and maintenance of tankers of the Shell fleet.

Countries which are already producing crude oil, often in jungle or desert regions, received supplies necessary for the maintenance of existing plant and equipment, as well as the necessities of everyday life. Areas, such as Venezuela and the Persian Gulf, where underwater operations are being carried out, received drilling barges and platforms together with thousands of tons of line pipe casing, tubing and drillpipe. Plant and equipment for the construction of new refineries or the extension of existing ones was sent to many parts of the world.

Nylon Goes to Work

SOME of the uses to which nylon is put in industry are shown in an illustrated booklet produced by British Nylon Spinners Ltd. Much, it is said, is still to be learned, but experts of British Nylon Spinners Ltd. already know how many problems can be overcome, and their advice is available to industry.

The booklet, 'Nylon Goes to Work', illustrates typical uses of nylon—filter cloths, belts and drives, and protective clothing, for example. There is also a description of tanks designed to prevent evaporation losses of petroleum and other highly volatile liquids. In this, a flexible membrane, expanding and contracting inside a protective shell, compensates for variations in the pressure of vapour above the liquid caused by temperature fluctuation. Proofed nylon is used for the membranes because its strength makes it possible to use a thinner fabric, reducing the weight of the membrane and improving its flexibility and sensitivity.

Publications & Announcements

LATEST issue of *Instrument Engineer*, published half-yearly by George Kent Ltd., Luton, Beds, is Vol. 1 No. 7. The contents are 'Models of Hydraulic Structures,' by David H. Kent; 'Gas Analysis by Thermal Conductivity Measurement,' by G. B. Brown and R. W. Dean; and 'The History of Flow Measurement by Differential Pressure—V: Commercial Metering of Air, Gas & Steam,' by John Lawrence Hodgson.

* * *

FOR many years W. Edwards & Co. (London) Ltd., Crawley, Sussex, have manufactured the cold cathode type of electron diffraction camera based on the original design of Professor G. I. Finch (*Proc. Roy. Soc.*, 1933, **141**, [A], 398; *Trans. Farad. Soc.*, 1935, **31**, [2], 1079; *Ergebn. der exakten Naturwiss*, 1937, **16**, 353). The company have recently redesigned the camera so that it incorporates the very latest valves, vacuum unions and fittings and pumping equipment, and the new camera is described in leaflet E. 145/1.

* * *

TECHNICAL Service Bulletin No. AB/1 of Monsanto Chemicals Ltd., 8 Waterloo Place, London S.W.1, reviews the preparation, properties and uses as a detergent of the sodium sulphonate of Monsanto Alkyl Benzene (tetra propylene benzene). During sulphonation it is essential to maintain a close control over temperature and acid concentration. Too high a temperature results in the formation of a discoloured product. The sulphonated material is neutralised by adding it to a dilute solution of caustic soda. Bleaching, if necessary, can be carried out after neutralisation. Hypochlorite is recommended, and any excess should be removed by the addition of the calculated quantity of bisulphite.

The bulletin goes on to suggest various formulations to suit the diverse uses to which detergents may be put. Sodium sulphate which is always present, is used as a neutral diluent. A useful alkali additive is sodium carbonate which assists in the emulsifying of oils. Other important additives are sodium silicate, sodium phosphates and sodium perborate and percarbonate which are used as mild bleaching agents for the boiling wash. The importance of thorough mixing of these materials is emphasised. Two useful appendixes contain respectively, laboratory preparation procedures, and analytical methods.

* * *

APPROXIMATELY 100 chemical patents are issued every week by the US Patent Office. To make this mass of information readily accessible a new weekly magazine, *Chemical Patgrams*, is now being published. In it each patent is set out in diagrammatic form to enable the reader to grasp its essential points rapidly. The editors claim that this system will save both time and money. Sample copies may be obtained from *Chemical Patgrams*, Box 5559, Washington, 16, DC.

* * *

PETROLEUM Films Bureau have published a catalogue of films which are available on loan, free of charge, to educational establishments, museums, public libraries, scientific and technical societies and to many other organisations, as well as to individual firms for showing to their employees. The range covered is extensive, including petroleum, aviation and motoring, power and engineering, agriculture and safety-first. These films are of both general and technical interest and it can safely be said that there is something here to suit all tastes. Most of these films are available in both 16 mm. 'non-flam.' and 35 mm. 'flam.' The majority have sound and many are in colour. Anyone interested should write to the bureau at 29 New Bond Street, London, W.1.

* * *

LATEST edition of the *Journal of Scientific Instruments* contains descriptions of many useful pieces of apparatus. A hydrogen Pirani leak detector designed by T. B. Kent of the United Kingdom Atomic Energy Authority, Capenhurst Works, Chester, employs a charcoal trap, cooled with either liquid nitrogen or solid carbon dioxide and trichlorethylene, placed between a Pirani gauge and the component under test. To vacuum-prove a component by this technique, it is enclosed in a hydrogen atmosphere which enters the leak and passes the charcoal trap, so inducing a pressure rise on the Pirani gauge. The charcoal trap eliminates the irregular and misleading pressure changes

due to components degassing, which are so troublesome when using hydrogen and an untrapped Pirani gauge. Temperatures in the range 200-500° C can be maintained constant to within ±0.025° C in an isothermal bath designed by W. H. Bridges, J. V. Cathcart and G. P. Smith of Oak Ridge National Laboratory, Tennessee, US. The bath liquid consists of a 50-50 wt. per cent mixture of sodium nitrate and sodium nitrite contained in a stainless steel pot and heated by electric immersion heaters. The temperature is controlled by an electronically balanced Wheatstone bridge in conjunction with a platinum resistance thermometer. A second resistance thermometer is used to monitor the temperature. Also described in this issue are photoconductive detectors for infra-red spectroscopy, a convenient way of heating a palladium osmosis tube and a magnetic pump for the laboratory in which an iron plunger is moved to and fro by two electromagnets working alternately.

* * *

FIRST paper in the latest issue of *Science Progress* (1955, **43**, 193-384) is a survey of recent work on the physical chemistry of sulphur, by Professor Geoffrey Gee, F.R.S., Professor of Physical Chemistry in the University of Manchester. Also of chemical interest are discussions of 'Some Methods of Studying Fast Gas-phase Reactions' by Dr. J. W. Smith of Bedford College, and 'Metallo-flavoprotein Enzymes' by Dr. C. Long of the Department of Biological Chemistry, University of Aberdeen.

* * *

EIMCO (Great Britain) Ltd., a subsidiary of the Eimco Corporation in America, have been operating in the filter field in this country for the past two years and last November established their own factory at Gateshead-on-Tyne, so that almost the entire range of equipment is available for sterling. The main exception is the Eimco Burwell Filter, which is a very recent development and at present can only be bought for dollars. The firm have issued a series of leaflets describing this and other filters in their range. Among these are continuous vacuum filters designed for the chemical industry. This equipment comes in various forms, according to the specifications of the customers. Filters are available constructed of non-ferrous metals, or wood, rubber covered or with various plastics or protective coatings. The new Burwell Filter is said to offer an important contribution to the efficiency of plate and frame pressure filtration. Among the exclusive features claimed are: substantial elimination of the hand labour costs usually required for plate and frame operation; mechanical instantaneous opening and closing; ability to keep the filter in almost continuous operation; provision for even cake formation over the entire plate surface; and higher washing efficiency.

* * *

AMINOETHYL ethanolamine is described in a four-page technical bulletin just issued by Carbide and Carbon Chemicals Company, a Division of Union Carbide and Carbon Corporation. Information is given on properties, specifications, shipping container contents, safe handling practices, applications, and selected references. This reactive chemical is used in the production of textile assistants, sequestering agents, and insecticides. It is of particular interest as a raw material for cationic surface-active agents. Copies of the aminoethyl ethanolamine technical bulletin (F-6455) are available from Carbide and Carbon Chemicals Company, 30 East 42nd Street, New York 17, New York.

* * *

THE Council of British Manufacturers of Petroleum Equipment announces that the 1955/56 edition of their composite catalogue of oilfield equipment manufactured in Britain will be published in May. This will be the 5th edition of *British Petroleum Equipment*, the first volume having been published in 1947. The new catalogue—which is the largest to date—consists of 770 pages, 88 pages giving details under classified headings of the equipment manufactured by the 400 members of the CBMPE, the remaining pages being catalogue entries compiled by individual members. Published price is £2 10s. and copies will be available from the Council's offices at 79 Buckingham Palace Road, London S.W.1.

* * *

ADDENDA and corrigenda containing alterations, additions and price revisions to previous catalogues are published at two monthly intervals by Hopkins & Williams of Chadwell Heath, Essex. It is possible to gain from a study of these some idea of the trend in prices of different chemicals.

Glass Bubble-Caps

GLASS bubble-cap columns of a size suitable for pilot plant work have been on the market in the past, but they have generally suffered from the disadvantage of having only one large cap per plate, and they were not very efficient although throughput was good. Loughborough Glass Co. have now brought out a range of columns which have a number of small caps on each plate, so providing high efficiency without affecting throughput. This has been made possible by making the risers and downcomers detachable from the plates.

The vapour-risers terminate in interchangeable cones which fit into tapered sockets in the plates, which are about ½ in. thick and made of heat-resisting glass. The bubble-caps and vapour-risers are sealed together to make integral units. These units could be retained by fitting pins through the parts of the cones which protrude below the plate, but experience has shown that it requires considerable pressure to dislodge the caps even when they are not pinned.

The columns are assembled by fitting the plates, with suitable gaskets, between standard pipe-line sections. At present columns are available in 6 in., 9 in. and 12 in. diameters, with 2, 5 and 9 caps per plate respectively.

The arrangement is extremely flexible, since all parts are standard and readily interchangeable, and columns can be built up to whatever number of sections are required without difficulty. With provision of access ports in the column sides, bubble-caps can be removed and cleaned without dismantling the column; holes in the plates can be stoppered if necessary. These columns have the great advantage over packed columns that results can be transferred directly to plant scale.

New Fungicide for Paint

RECENT surveys have shown that the discoloration of paint and the failure of the film, particularly in buildings of high humidity, is often due to attack by fungus rather than ordinary dirt.

The Nuodex organisation, research pioneers in this field, have carried out intensive studies on the subject, successfully isolating as many as 30 different fungi which flourish on paint films. The research has resulted in the introduction of a new fungicide, Nuodex 321.SS, which is completely soluble in mineral spirits and compatible with emulsion paint systems, and effectively precludes such premature decorative loss of the paint.

Nuodex Fungicide is permanent and insoluble in water and will neither evaporate nor crystallise from the paint film on exposure. It will remain fully effective for the service life of the paint and is equally successful in the home kitchen and bathroom, factories where high humidity prevails, and outdoors in a humid climate.

The fungicide is distributed by Durham Raw Materials Limited at 1-4 Great Tower Street, London E.C.3, 1 Booth Street, Albert Square, Manchester 2, and 180 Hope Street, Glasgow C.1.

A Loughborough 12 in. diameter glass bubble-cap column

Next Week's Events

TUESDAY 26 APRIL

Royal Institute of Chemistry

Leatherhead: Laboratories of BCURA, PATRA and BFMIRA, 2.30 p.m. Visit, followed by 'Writing Wrongs' by A. L. Bacharach.

Chemical Society

Belfast: Chemistry Lecture Theatre, Queen's University, 7.45 p.m. Reading of original papers.

Institution of Chemical Engineers

London: May Fair Hotel, W.1. Annual corporate meeting and dinner.

Society of Instrument Technology

London: Manson House, Portland Place, W.1, 7 p.m. 'Magnetic Amplifiers as Industrial and Laboratory Aids' by R. J. Russell-Bates.

WEDNESDAY 27 APRIL

SCI (Food Group)

Bournemouth: Town Hall, 10 a.m. 'The Contribution of Processing Techniques to the Nutritional Value of Food' discussion.

SCI (Corrosion Group)

London: Burlington House, Piccadilly, 6.30 p.m. Annual general meeting, followed by 'Some Thoughts on the Practice of Applied Science' by Dr. J. C. Hudson.

Society of Cosmetic Chemists of Great Britain

Walton Heath, Surrey: 9 a.m. (approx.) Golf Tournament.

Textile Institute

Bolton: Town Hall, 2.30 p.m. Annual general meeting, followed by 'The Interrelationship of the Chemical and Textile Industries,' annual Mather lecture, by H. Jackson (I.C.I.).

Institute of Physics

London: 47 Belgrave Square, S.W.1, 5.30 p.m. Industrial Spectroscopy Group meeting: 'Spectroscopic Evidence on the State of Equilibrium in Flame Gases' by Dr. A. G. Gaydon.

THURSDAY 28 APRIL

Royal Society

London: Burlington House, Piccadilly, 4.30 p.m. The Bakerian Lecture: 'The Acceleration of Charged Particles to very High Energies' by M. L. E. Oliphant.

Royal Society of Arts

London: John Adam Street, Adelphi, W.C.2, 5.15 p.m. 'The Commonwealth as a Source of Essential Oils' by M. F. Carroll.

Society for Analytical Chemistry

Edinburgh: George Hotel, George Street, 7.15 p.m. Reading of original papers.

FRIDAY 29 APRIL

Institution of Chemical Engineers

Newcastle-on-Tyne: Department of Chemical Engineering, Stephenson Building, Claremont Road, 6.15 p.m. Graduates' and Students' Section: Annual meeting of North-East Centre, followed by films.

Institute of Metal Finishing

Sheffield: Grand Hotel, 6.30 p.m. Industrial film show: 'Corrosion at Work' and 'Die Castings: How Else Would you Make it?'

Kent Products in Canada

KENT-Norlantic Ltd. of Toronto, a subsidiary of George Kent Ltd., Luton, England, are exhibiting a wide range of their industrial measuring instruments and controllers at the Canadian International Trade Fair at Toronto (30 May to 10 June). On the basis of the progress already achieved by Kent-Norlantic Ltd. in serving Canada's industry with a restricted range of industrial meters and instruments, it has now been decided to release a much wider range of products for sale in Canada.

The new Kent-Commander range of instruments will be the most prominent feature on the stand, a section of which will be devoted to some of the products of The Candy Filter Co. Ltd., Midland Industries Ltd. and Aquastat Ltd. Kent-Norlantic act as a representative in Canada for these firms.

Anti-Corrosion Material in Roumania

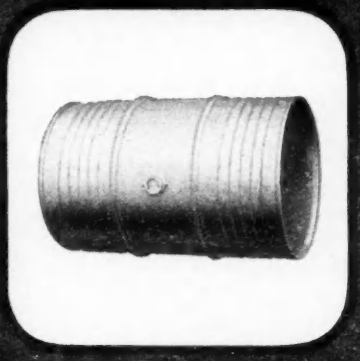
A new anti-corrosive material called grafinert has been manufactured by Roumanian chemists, it is claimed. The material is said to be obtained by pressing a mixture of graphite powder and macromolecular products which act as binders. It is being used in the construction of chemical equipment, replacing special varieties of steel, non-ferrous metals, etc.

The SQUARE TAPER

The ROBBICAN

"AMERICAN" PAILS

P.T.L. KEGS 5" to 14" DIAMETER



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Law & Company News

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages & Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages or Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary but such total may have been reduced.)

L. & P. PLASTICS LTD (formerly Fanfare Plastics Ltd. & Sansare Plastics Ltd.), London S.E.—14 March, assignment securing to Midland Bank Ltd. all money due or to become due to the bank from L. & P. Developments Ltd.; charged on certain moneys. *£1,500. 14 January, 1955.

Satisfactions

STEWART PLASTICS LTD., London W.—Satisfaction, 19 March, of charge registered 6 September, 1948.

W. & J. GEORGE & BECKER LTD., Alperton, chemical and physical apparatus manufacturers.—Satisfaction, 17 March, of mortgage & charge registered 2 December, 1946.

New Registrations

Cirencester Building Chemicals Ltd.

Private company. (547,168.) Capital £100. Manufacturers of and dealers in building chemicals (including concrete hardeners, waterproofers, plasticisers, non-dusting compounds and other chemical aids to building), etc. Directors: Richard E. Holborow, Richard W. Holborow and David J. Holborow. Secretary: David J. Holborow. Reg. office: 36 Oxford Street, W.1.

Fisher-Finlay Enterprises Ltd.

Private company. (547,585). Capital £100. To develop inventions, patents and secret processes relating to the electrical, mechanical, electronic, chemical and all other sciences, etc. Directors: Alfred Fisher and Gerald Finlay. Secretary: G. Finlay. Reg. office: 43 Upper Berkeley Street, W.1.

Alcohols Ltd.

Private company. (547,325). Capital £1,000. Manufacturers of and dealers in methylated spirit, both industrial and mineralised, power alcohols, methyl alcohol, etc. Directors: Wm. R. Wallis and Albert E. Young. Secretary: W. R. Wallis. Reg. office: Liverpool House, 15/17 Eldon Street, E.C.2.

Honeywill-Atlas Ltd.

Private company. (547,640). Capital £10,000. Factors, merchants, manufacturers, importers and exporters of all form of hexitols, hexitol derivatives and other chemicals and chemical products, etc. Reg. office: 21 St. James Square, S.W.1.

Company News

Fisons Ltd.

The directors of Fisons Ltd. have decided to make an immediate issue of ordinary shares to raise well over £2,000,000. The issue comprises 967,477 £1 ordinary shares, and ordinary stockholders are to be given the right to take up one share at 45s. for every £5 of stock.

British Petroleum Co. Ltd.

The board of the British Petroleum Co. Ltd. has decided that the company shall become wholly a holding company by divesting itself of its trading activities which are being taken over by BP Trading Ltd., a wholly-owned subsidiary which has been formed for the purpose.

Brotherton & Co. Ltd.

Net profits of Brotherton & Co. Ltd. in 1954 rose from £201,923 to £267,518—the second highest figure since the company became public. A final dividend of 12½ per cent is proposed, which will raise the total payment to 17½ per cent (last year 15 per cent).

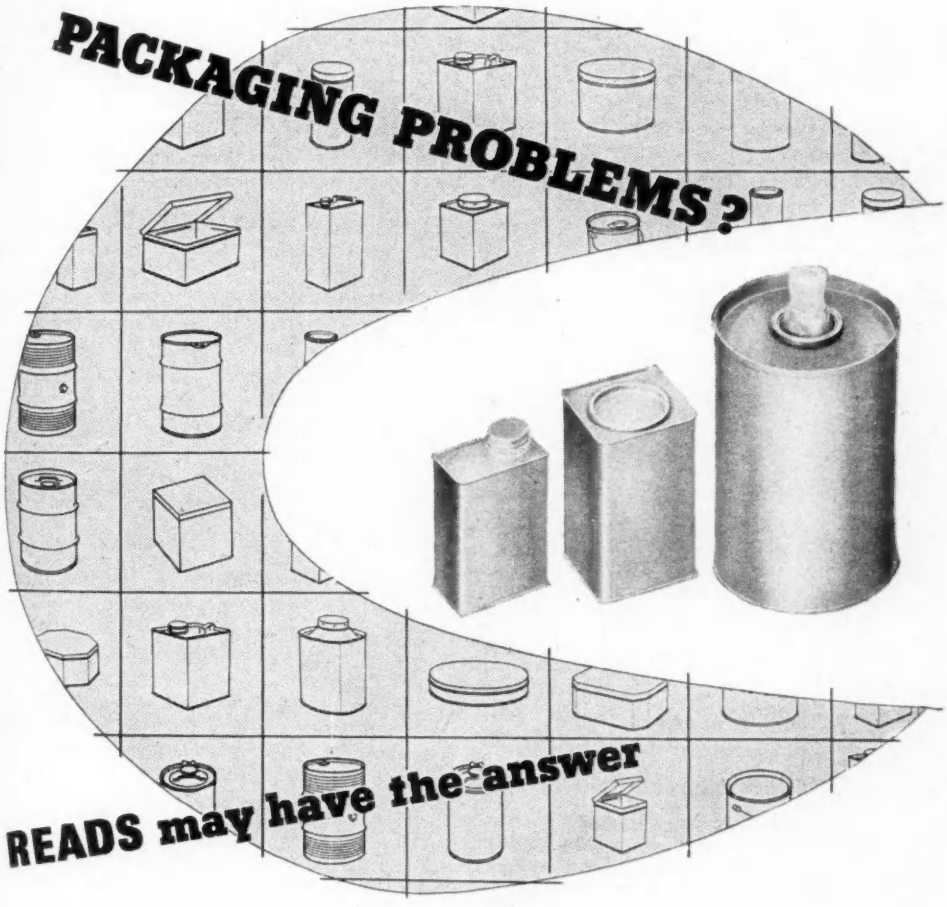
C. A. Parsons & Co. Ltd.

Record profits were made by C. A. Parsons & Co. Ltd. during 1954. Net profit, after tax and other deductions, amounts to £1,484,298, against £807,862. Distribution is to be raised from the equivalent of 7½ per cent (allowing for a one-for-one scrip issue) to 10 per cent.

Ampol Petroleum Ltd.

Ampol Petroleum Limited, of Australia, increased its profits by £A88,987 to £A455,917 for the year ended 30 September, 1954, turnover being increased by 9.7 per cent.

[continued on page 960



. . . if it's a question of metal containers

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Company News

continued from page 958

Dr. V. E. Yarsley (Plastics Testing Laboratory) Ltd.

Dr. V. E. Yarsley (Research Laboratories) Ltd. announces that in view of the increasing demand for the routine testing of plastics materials, it has been decided to extend the facilities available in the company's physical testing department and establish this on the basis of an independent company, to be known as Dr. V. E. Yarsley (Plastics Testing Laboratories) Ltd. The new company will be directed by Dr. V. E. Yarsley.

Unilever Group

Turnover of the Unilever group for 1954 increased to the record figure of £1,437,429,000, compared with £1,310,121,000 for 1953. Combined trading profit increased by nearly 14 per cent to £70,095,000 and the net profit after tax from £25,799,000 to £31,854,000, including £2,667,000 exceptional items and non-recurring profits. Unilever Ltd. is paying a final dividend of 9¾ per cent, making 15¼ per cent total. Unilever NV recommends a final dividend of 8¾ per cent, making 14 per cent. These are the same percentages as in 1953, but are payable on increased capitals.

To Make New Products

IN his annual statement, Mr. Rudolph de Trafford, chairman of Manchester Oil Refinery (Holdings) Limited, says that the company has now satisfactorily concluded research and pilot plant work on the production of a new high quality range of petroleum sulphonates, which are of growing importance in the manufacture of metallic soaps for additives and cutting oils, detergents, etc. 'The work has been somewhat protracted, but I am hopeful that the arrangements which we have made for the expansion and improvement of our output of these products will be completed during the current year and will bear fruit in 1956', he says.

The new wholly-owned subsidiary, Trafford Chemicals Limited, started operation during the first half of the year and is producing a limited range of fine chemicals which are meeting a satisfactory reception. Flexibox Limited, in which Manchester Oil Refinery own two-thirds of the issued capital, again had the best year in its history. The arrangements entered into for the promotion of its business in the US, France and Germany have produced gratifying results. In a reference to Albatros SA Belge pour le Raffinage de Petrole of Antwerp, in which the company first acquired an interest in 1948, Mr. de Trafford says that the long term outlook is satisfactory and the investment will prove profitable.

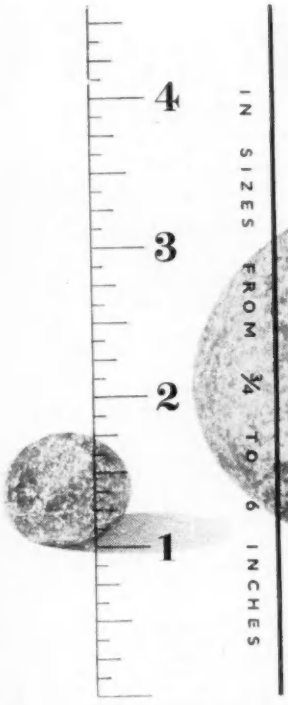
'It is our policy to enlarge the range of both our petroleum and our chemical products', he goes on. 'Our programme provides for the production during the current year of certain materials which have not hitherto been produced in this country, and while we do not anticipate any marked contribution to earnings from this development policy in 1955, it is our hope that in 1956 material benefits will accrue from our broadened activities.' The meeting is on 29 April.

Market Reports

LONDON.—The industrial chemicals market has returned to the pre-holiday level of activity and buying for home trade is spread over most sections. Export enquiry remains good. The general run of the soda and potash chemicals are steady and unchanged and there is a good call for solvents. There is nothing of fresh importance to record in the coal tar products market, most items being well sold forward; in consequence available supplies find a ready outlet.

MANCHESTER.—The call for contract deliveries of heavy chemicals on the Manchester market, including caustic soda and other alkalis, as well as the potash and ammonia compounds, has been on a good scale during the past week; and a fair number of fresh enquiries are being dealt with. Prices are steady to firm pretty well throughout the range. In the fertiliser section the call for superphosphates, sulphate of ammonia and the compounds is now on steady lines. There has been little change in the position of the tar products and most of the leading light and heavy materials are being taken up in good quantities.

GLASGOW.—The market generally was quiet during the opening part of the week, as was expected, due to the Easter holidays. During the latter part, however, business showed a tendency to revert to normal, with prospects good. The export market still remains steady.



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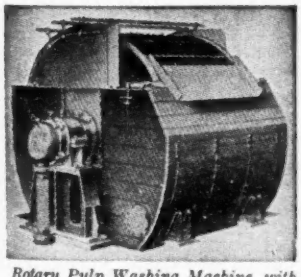

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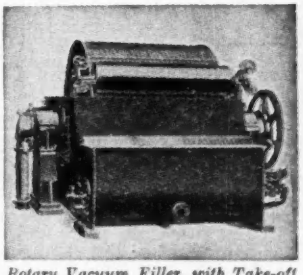

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EXAMINATIONS 1955

THE present Examination will be held for the last time in 1955.

Particulars of this and the new Examination, together with application forms which are returnable by the 1st June, 1955, may be obtained from: The General Secretary, **THE INSTITUTION OF CHEMICAL ENGINEERS, 56, VICTORIA STREET, LONDON, S.W.1.**

SITUATIONS VACANT

The engagement of persons answering these advertisements must be made through a Local Office of the Ministry of Labour or a Scheduled Employment Agency if the applicant is a man aged 18-64 inclusive, or a woman aged 18-59 inclusive, unless he or she, or the employment, is excepted from the provisions of the Notifications of Vacancies Order, 1952.

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Requests for application forms by POST-CARD to Senior Recruitment Officer, A.W.R.E., Aldermaston, Berks, quoting reference 610/WGE./38.

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PATENTS

THE proprietor of British Patent No. 574803, entitled **"APPARATUS FOR THE TREATMENT OF BLOOD,"** offers same for license or otherwise to ensure practical working in Great Britain. Inquiries to **SINGER, STERN & CARLBERG, 14, E. JACKSON BLVD., CHICAGO 4, ILLINOIS, U.S.A.**

THE Proprietors of British Patent No. 647,887 for **"NEW OR IMPROVED PROCESS AND APPARATUS FOR THE MANUFACTURE OF ZINC OXIDE,"** desire to enter into negotiations with a firm or firms for the sale of the patent, or for the grant of licences thereunder. Further particulars may be obtained from **MARKS & CLERK, 57 & 58, LINCOLN'S INN FIELDS, LONDON, W.C.2.**

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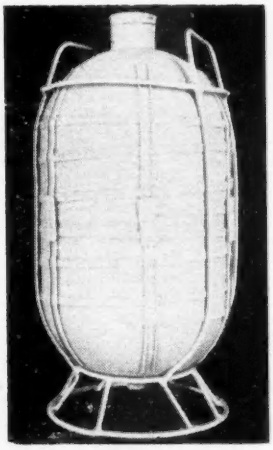

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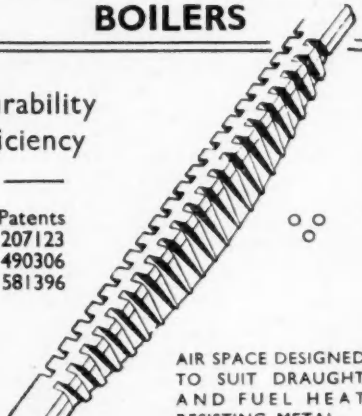

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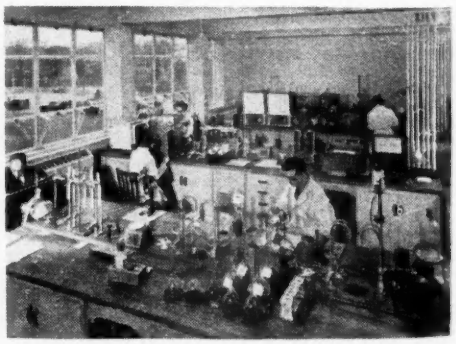

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INDEX to advertisers in this issue

	Page
Albright & Wilson, Ltd.	927
Baird & Tatlock (London), Ltd.	930
Bamag (1953), Ltd.	926
British Thomson-Houston Co., Ltd. (The)	919
Classified Advertisements	962, 963, 964
Collins Improved Firebars, Ltd.	964
Cygnet Joinery, Ltd.	964
Gallenkamp, A., & Co., Ltd.	924
Girling, S., & Sons (Coopers), Ltd.	965
Imperial Chemical Industries Limited, Plastics Division	Cover iii
Kaylene (Chemicals), Ltd.	Front Cover
Key Engineering Co., Ltd. (The)	Cover ii
Lennox Foundry Co., Ltd.	965
Lord, John L.	Cover iv
Manlove Alliott & Co., Ltd.	922
Metropolitan-Vickers Electrical Co., Ltd.	Cover iv
Mond Nickel Co., Ltd.	923
Moritz Chemical Engineering Co., Ltd. (The)	966
National Enamels, Ltd.	Cover ii
Nordac, Ltd.	928
Reads, Ltd.	959
Robinson, F., & Co., Ltd.	957
Shell Chemicals, Ltd.	921
Towers, J. W., & Co., Ltd.	925
Uniflo:, Ltd.	961
Walley, A. L.	961
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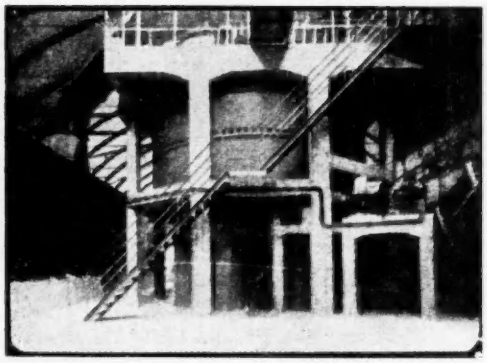

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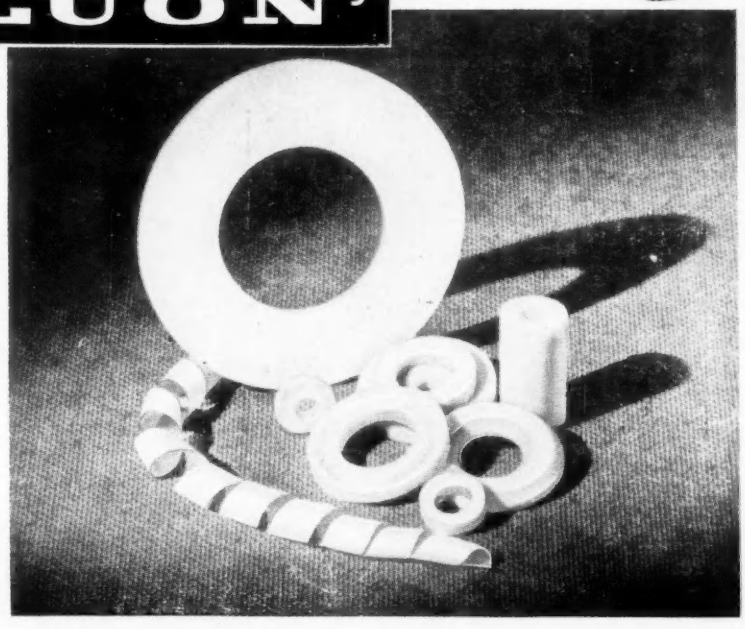

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